THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCIII. No. 2237.] LONDON, MARCH 27, 1906. [58TH YEAR. PRICE 6d.

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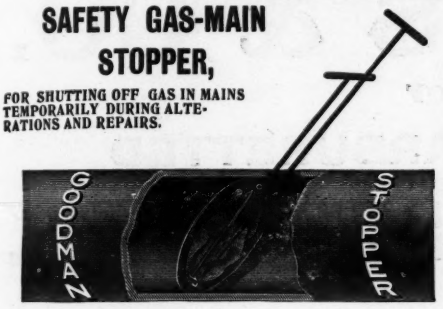

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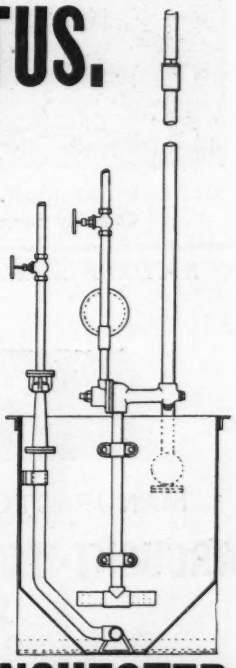

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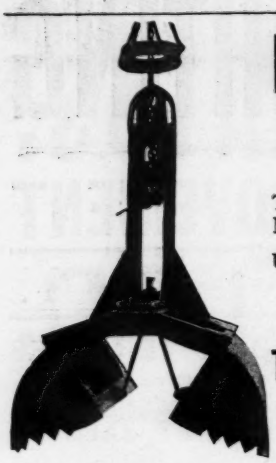

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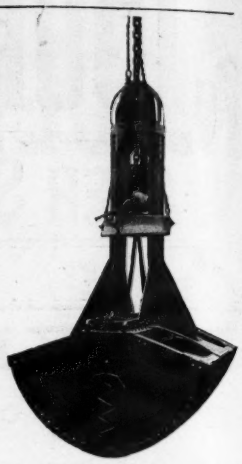

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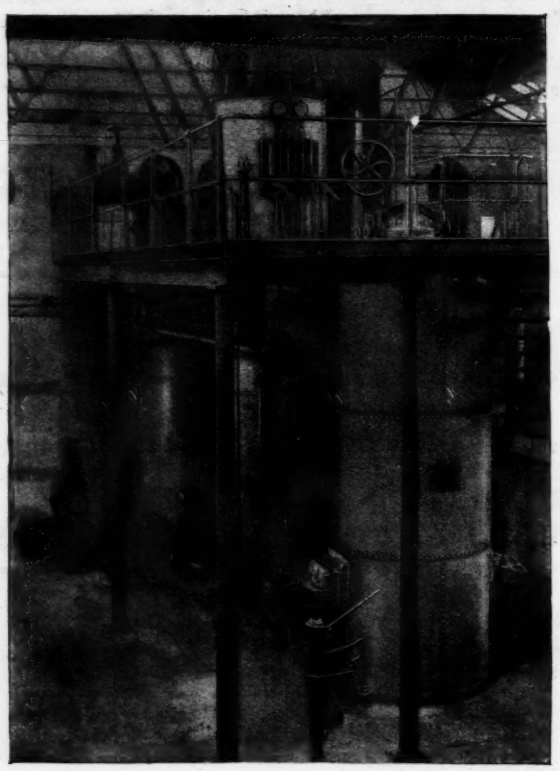

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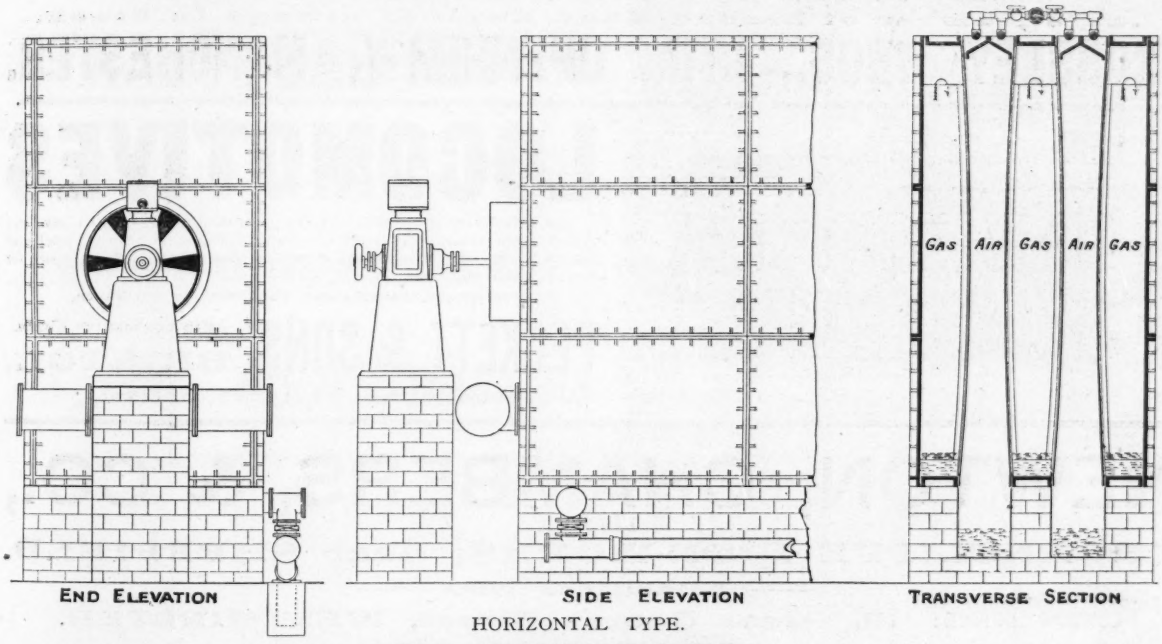

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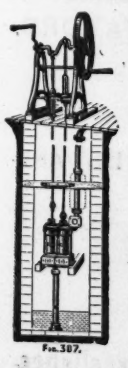

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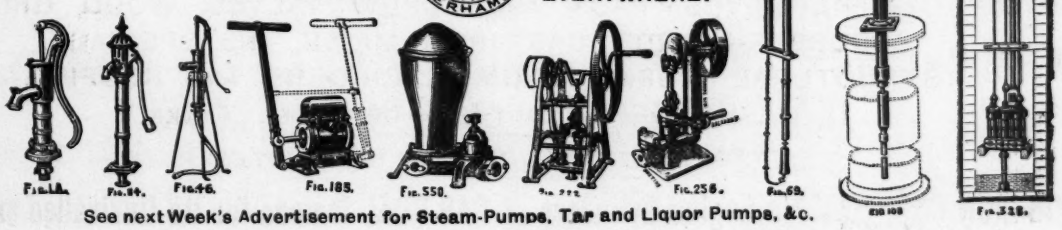

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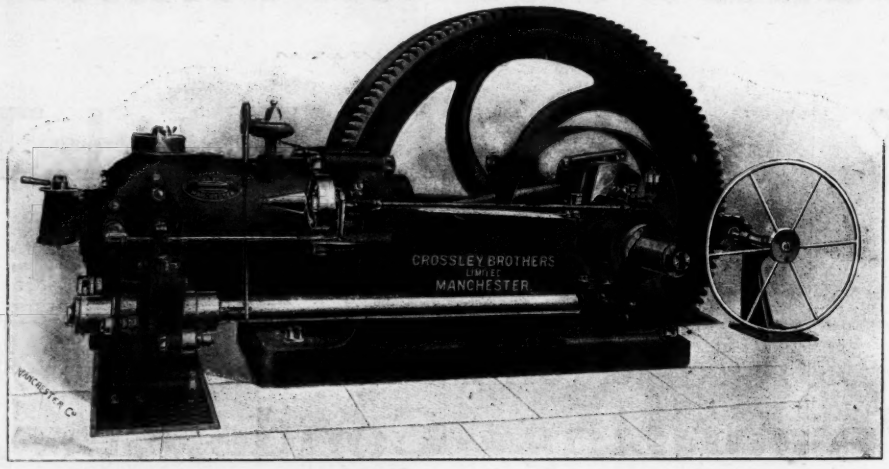

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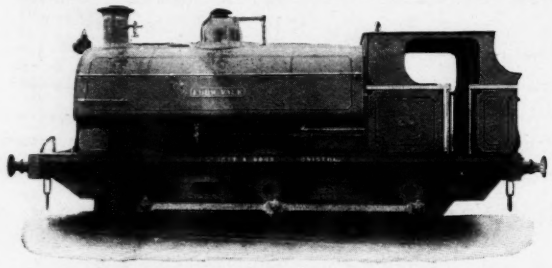

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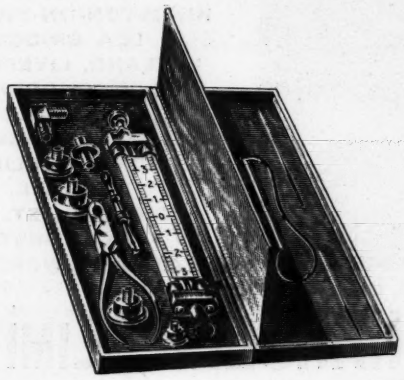

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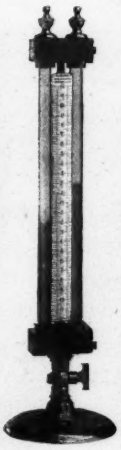

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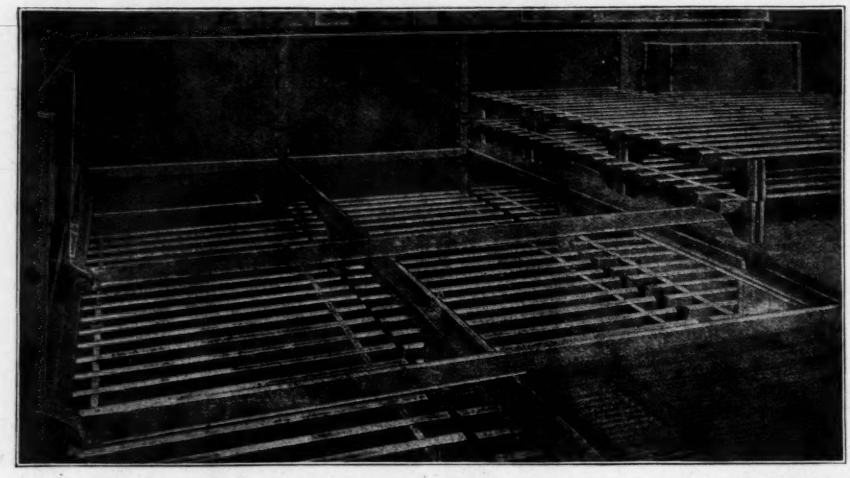

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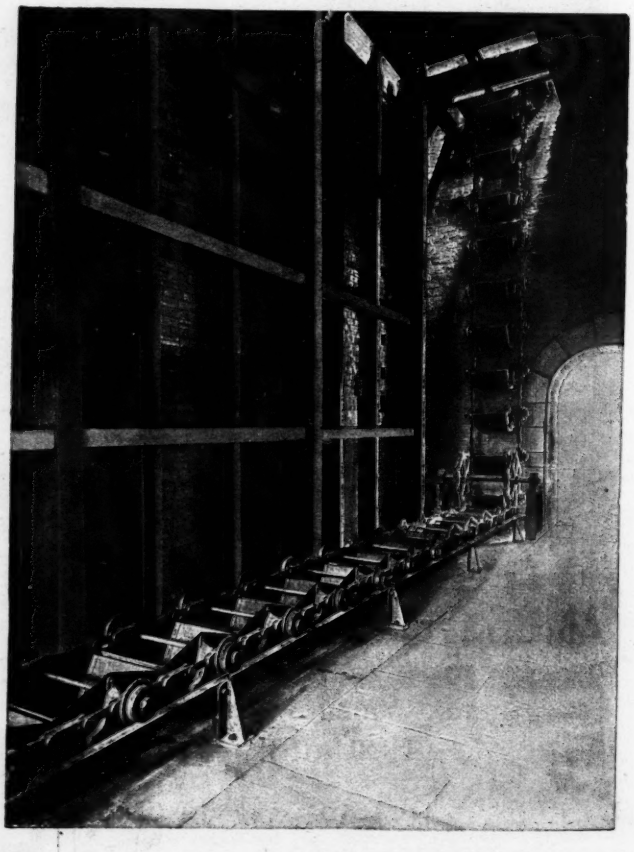

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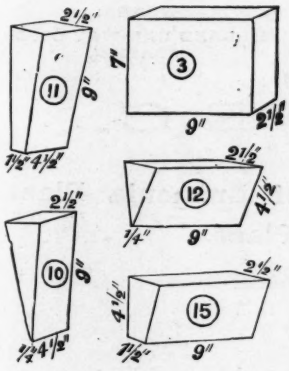

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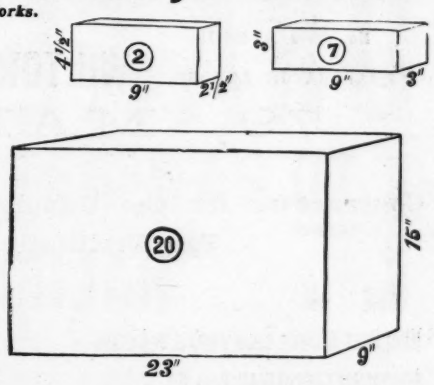

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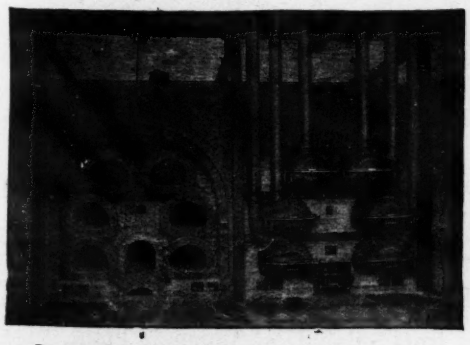

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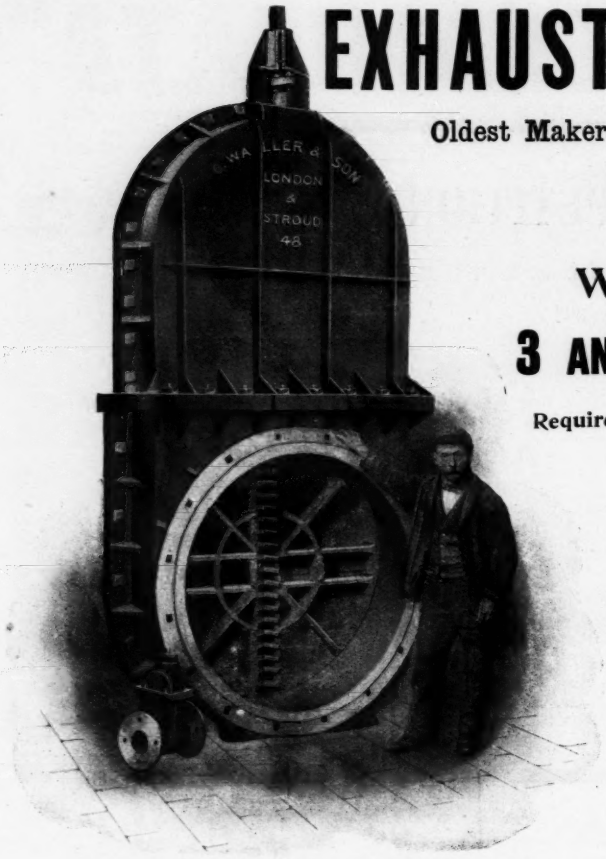

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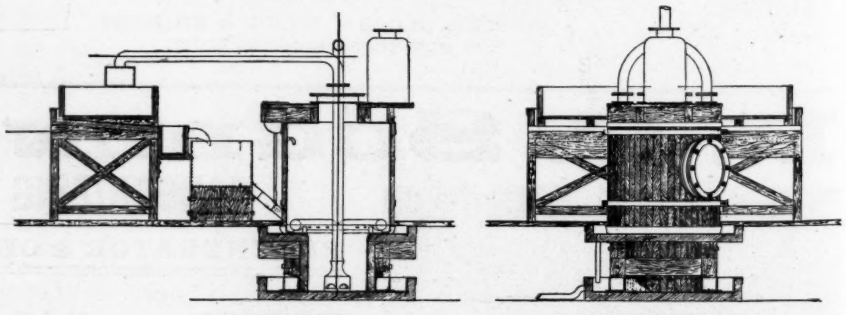

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EDITORIAL NOTES—GAS, &c.

The Week at Westminster—A New Danger.

THERE are only two or three matters that call for special comment in connection with the parliamentary proceedings of the past week. The first one is of a regrettable nature; but it demands some protest in defence of that dignity and courtliness which are traditional of the Committee-rooms. Labour has its duties as well as its privileges; but the latter ought not to be abused, or even unduly obtruded, during the performance of the former. This is a lesson that Mr. John Hodge, M.P., has yet to learn. It is his privilege to be a representative of Labour in the House; among the duties allocated to him is the serving on the Select Committee who (under the courteous chairmanship of Mr. H. J. Tennant) have been considering the Gas Bills in Group A. But Mr. Hodge appears to be one of those gentlemen who cannot see good in any trading enterprise which is not under municipal management; and, in consequence of this, during the examination of the witnesses for the promoters of the Merthyr Tydfil Gas Bill, interrogations and comment fell from Mr. Hodge which were most objectionable, and, in some instances, personally offensive. It is a new thing for a Chairman in a Committee room to be moved to reprove a colleague; but it happened in this case. And gentlemen appearing before Parliamentary Committees have a right to be protected from unworthy insinuation. Labour members who cannot appreciate the dignity of their position, and forget what is expected of them in honourably discharging their duties, will not be successful in advancing, nor will they encourage sympathy towards, the interests of those they were specially sent to Parliament to represent. Municipalization is at the very top of the Labour programme; but Labour members who are put on Select Committees ought to leave their predilections in this regard outside the Committee-rooms. Mr. Hodge has early shown that a new danger menaces Private Bill procedure and legislation.

A sketch of the principal features of the work of the week will be found in our "Notes from Westminster." Therefore only two other matters need be noticed here. The Merthyr Tydfil Corporation sought to create a precedent in urging the insertion of a purchase clause in a statutory Gas Company's Bill; but they were unsuccessful. They only obtained the inclusion of a clause suspending the powers conferred on the Company (save in respect of capital expenditure for defined purposes) until the fate is known of a Purchase Bill which it is the Corporation's intention to promote in the next session of Parliament. This is an altogether different thing from a purchase clause. Where such a clause is inserted in a non-statutory company's Bill, it prevents the company, on the Purchase Bill being promoted, contesting the principle of purchase, and only allows them to oppose upon details. This is not the case here. The Merthyr Company will be at liberty to take all legitimate steps to secure the overthrow of the Council's Bill, if it is introduced, precisely in the same manner as if the Company had not been in Parliament this year; for nothing in the Act "shall be deemed to prejudge or prejudice, one way or the "other, the question of such purchase."

The second matter claiming notice is the protection that the Mirfield Gas Company sought against the obligation of giving a stand-by supply of gas to owners of suction-gas and other forms of producer-gas plant. The clause as they introduced it has been enlarged by the Lord Chairman, acting on the advice of his Counsel (Mr. Albert Gray), so as to make it compulsory on the user of a suction or producer gas plant to give 24 hours' notice each time he requires a supply of gas from the Company; and then the Company are not bound to supply, if this cannot be done without jeopardizing the service to their regular customers. Though worded somewhat differently, the power now conferred by the clause is very similar—even to the 24 hours' notice—to a provision that appeared in the defunct Bill of the Ossett Corporation of this session. Electrical legislation affords several like precedents regarding stand-by supply; and it is surprising that the recommendation of some years ago, that gas undertakings should follow this lead of electricity suppliers, has not, until now, been seriously considered. The utility of such protection is so obvious that it need not be dilated upon; but it may be assumed that gas undertakings will take advantage of any future application to Parliament to secure this particular form of defence. Its possession may on occasion be very useful; and the knowledge of the existence of such a power may weigh with manufacturers.

Liability for Damage to Mains—Important Judgment for Pipe-Owners.

A CASE which is of considerable interest to all gas and water undertakers was decided last week in the Chancery Division of the High Court of Justice, before Mr. Justice Farwell. The London Hydraulic Power Company sued the Pall Mall Electric Light Company for damage to one of their mains in Piccadilly Circus. The main in question was laid about 5 feet below the surface of the street, and is 6 inches in diameter and 1½ inches thick. Upon this the defendant Company had built one side of a manhole or inspection chamber, which is formed of brickwork. This chamber was drained at the bottom by a 2-inch drain pipe turning into the soil under the main, to carry off any moisture that might get into the manhole. The plaintiff Company were entirely unaware of what had been done by the defendants, who gave them no notice of their intention to construct the inspection chamber. In July last year, the main burst, having sustained a transverse split or fracture close to a flange, of which there are three—this pipe being a junction pipe—in the vicinity of the inspection chamber. It was urged by the plaintiffs that the latter was wrongfully constructed by being allowed to rest on their main, and that the fracture was caused by the vibration and pressure of the traffic passing over the top and cover of the inspection chamber being communicated to the pipe by the brickwork resting upon it. They therefore claimed damages for the cost of repairing the main, and for the loss of 500,000 gallons of water. They also claimed a declaration that the defendants were responsible for any further damage for which the plaintiffs might be held liable to other persons arising out of the escape of the water. This was contested by the defendants, who denied the allegation that the construction of the inspection chamber was wrongful, and also that vibration or pressure was transmitted to the plaintiffs' main by the chamber. They further pleaded that they had, in the construction of the latter, been acting in pursuance of their licence, and therefore counterclaimed for the damage done to their inspection box and electric lighting mains by the breaking in of the water from the plaintiffs' main. The learned Judge decided on the claim, and also on the counterclaim, in favour of the defendants, on the ground that the onus of proof was on the plaintiffs, and that they had not proved to his satisfaction that the position of the chamber had had anything to do with the breaking of the water-main. It followed from this that the plaintiffs were liable for any damage resulting from the escape of water from their main; and judgment was given accordingly.

This was but the natural sequence to their failure to fix liability upon the defendants for the breaking of the main; and the learned Judge must be presumed to have fully weighed the evidence on both sides. It is impossible, however, not to sympathize with the plaintiff Company in such a case, since the decision might almost appear to establish the right of an electric light or other company to rest the brickwork of their manholes upon the mains of some other company with entire impunity as to consequences. It can scarcely have been a mere coincidence that this hydraulic main, 6 inches diameter and 1½ inches thick, broke at this particular spot. Such a main is by no means easily broken, even although it is charged with a pressure of 750 lbs. per square inch, protected as this one was with about 5 feet of

covering. Few would venture to say, in fact, that it could be broken by street traffic under such conditions. Suppose, however, that some solid, unyielding substance intervened; that, for example, there was a tee in the main looking upwards, with a pipe upon it extending to the road surface, where it was directly exposed to the weight of the traffic. Would anyone be bold enough to assert that, under such circumstances, a breakage in the vicinity of the tee was an unlikely occurrence? Yet this supposition is analogous to the circumstances under which breakage actually occurred; the brick wall of the inspection chamber taking the place of the tee and the upright pipe.

After this judgment, gas and water companies require to be more than ever on their guard against the too close proximity of manholes in connection with electric light or traction mains; and the fullest protection afforded by the law should be insisted on in all cases. To gas undertakings the almost ruinous consequences which might result from the breaking of a gas-main justify the adoption of every precaution, and the utmost watchfulness.

Are the "Benefits" of Public Electric Lighting Hypothetical or Real?

THE inquisition of the "Standard" into the municipal finances of the London boroughs has been from time to time noticed in our columns, generally in the "Electric Lighting "Memoranda." These articles should appeal strongly to all classes of ratepayers, who can from them readily trace that, while extravagance is partially responsible for the overwhelming local debts and the embarrassing amount of the rates, to the satisfying of the prevailing municipal hungering after trading venture on borrowed moneys is largely due the disastrous increase in a community's liabilities and consequent financial burdens. However confusing the municipal accounts may be, and however cryptic the illegitimate charges against various unproductive departments to give trading results an appearance, if not of excellence, of profitableness, the ratepayers may take it for granted that the growing debt, the increasing rate poundage, and the in many cases unjustifiable advancing assessments, together represent the sequel of mismanagement generally and of unnecessary interference with affairs which ought not to be municipal, but should be left to private enterprise, voluntarily prepared to shoulder both the cost of introduction and the risk. In our notices of the articles of our morning contemporary, the municipal bungling which has inflated the rates has been brought into view, seeing that the increase in the rates bears with great severity upon gas companies and their customers; and two of the causes of this severity —the municipal electricity undertaking and the public lighting—have been demonstrated to have been powerful contributors. Through the claims of other matters, the continuing articles (since last attention was devoted to them) have been neglected; and therefore an article elsewhere has been set apart for reference to the fresh exposures of prodigality, particularly in respect of public lighting, arising from the introduction of electricity.

According to the apologists for the municipalities, prodigality, extravagance, or whatever other name is applied to their ultra-liberality in expenditure, are misnomers for the lofty ideal they have set up. No matter what a thing costs, if it is the best it must be had. That is one of the established principles of the latter-day municipalists. The second best will not do, though it may be but a shade inferior to the best, and costs but a moiety of it. That is not practical or thrifty government; and it is not the way our local ediles direct their own private affairs. But it is their manner of acting when dealing with—this the most pertinent example for our purpose—the public lighting, on the pseudo-assumption, when the electric lighting undertaking is town property, that in the electric light they have the best of the artificial means of street illumination, and that the town shall have it no matter how uneconomical it is for the purpose. Hence the great increase in the cost of illuminating London streets without any real benefit to the ratepayers. Let the ratepayers of London be asked what they have really obtained for this increased expenditure. The professed idea was that the streets should be made more attractive and safer, with tangible results to the ratepayers. Where are these tangible results? Has business increased in the districts, have the rates become lighter through an influx of residents attracted by the unpractical method of illuminating streets by means of widely-separated large centres of light, or has the most costly illumination stayed the exodus of the well-to-do residents in the Administrative County of London to the suburban districts beyond, where electric lighting is carried on (if at all) on a more modest scale? As to enhanced safety, are accidents fewer, has crime been lessened, and is the police rate lighter? If the change in illumination has not accomplished these things, then what other tangible advantage have the ratepayers of London obtained to justify the greatly increased expenditure? We challenge any one of our municipal friends to produce an illustration of beneficial effect from extravagance in expenditure on public lighting that could not have been realized by equally efficient and less expensive means. There is no sense in public expenditure that is not productive of some valuable return. It would not be difficult to show that it would be a sensible and businesslike proceeding for some boroughs to adopt incandescent gas lighting in place of their electric lamps; for the cost of conversion would soon be recouped by the annual savings in lighting expenses.

This view appears to be shared by the City Corporation, but it is not by the Mayor of Islington; the Council over which he presides having an electric lighting undertaking which has been shamefully bolstered up at the expense of the ratepayers through the public lighting, as is shown by an article in another column. "To talk of going back to "gas," says his Worship, "in place of electricity is quite "impossible;' and the Borough Council, "as a lighting "authority has, so far as the resources at its command "admit, to give the people of all parts of the borough the "best possible lights in their streets." The "best possible "light"—whether by electricity, gas, or other means—is an extravagant light; and there is no call upon the authority of any borough to give extravagant lighting in any part of their area, let alone "all parts." Adequate lighting and no more is the view of the administrative economist; anything exceeding adequacy is the work of the squanderer and the extremist. We have no doubt that, as a set-off against what has happened in the City and elsewhere in the way of incandescent gas lighting successes as against electricity, the recent decision of the Islington Borough Council to depose 714 gas-lamps in favour of 245 flame arc lamps at a capital cost of £21,011, which represents an initial cost of about £85 per lamp, will be widely quoted. It is this enormous capital commitment that causes councillors of moderate view to hesitate, when a more economical method of lighting offers, in the undoing of the work of their predecessors in office. It is a mischievous form of government that permits, outside of sanitation and protection, of wicked waste, that binds and burdens without advantage, not only the ratepayers, but those who succeed to the reins of office. On the further conversion of gas-lamps to electricity in Islington, the ratepayers will have to meet the interest on the capital expenditure and repay the principal, as well as maintain this large number of flame arcs, the wear and tear upon which is considerably more than upon the ordinary form of arc lamp. All this in addition to the running cost! And yet the ratepayers are being asked to believe that the total expense will be but little more than for maintaining the existing incandescent gas lighting. It will be unique electric lighting if the prediction turns out to be true. And if it should be true, then the charge for electricity for public lighting will not be the old one of 3½d. per unit, which is the price the ratepayers have been paying, through street illumination, towards the support of the electricity undertaking. If the charge is below 2·21d., then it will be short of the amount that figures as the total costs per unit of electricity (excluding capital charges) in the analysis of the department's working for 1905. Then there is the question of efficiency. These 245 flame arc lamps are to be scattered through 15 miles of streets, which gives an average of only 16 lamps per mile, as against 47 gas-lamps. Does it not follow that greater uniformity of illumination can be obtained from 47 centres of light per mile than from only 16?

We repeat the question, What material profit have the additional thousands of pounds expenditure per annum on public electric lighting, and that only partial, brought to the districts concerned? If none can be shown, then those who are responsible stand convicted of wilful waste of public funds. An answer will both oblige and interest; but if there is no answer, then it may be taken, without further discussion, that the "benefits" of public electric lighting are hypothetical and not real.

Professor Lewes on Fire Risks and Fire Prevention.

THE course of Cantor Lectures on the above subject which is being delivered by Professor Lewes at the Society of Arts, a summary of the first two of which appears in this issue, will be followed with considerable interest; for of the author it may be truly said that he touches nothing but with the hand of a master. Apart, however, from the personal magnetism which Professor Lewes always exercises over his audience, and the attractiveness with which he invests his subject, this particular topic is one that appeals to all, since both life and property are but too often at the mercy of the devouring element. The magnitude, from the monetary point of view, of the interests involved is apparent from the fact that the annual loss in the British Isles alone is estimated at seventy millions sterling per annum.

There is much to attract the general reader in these two lectures, particularly in the historical sketch of the development of knowledge of the cause and nature of fire, and the lecturer's description of the ordinary phenomena of combustion. But that smoke does not, as is popularly supposed, consist mainly, if not entirely, of particles of carbon, but, in reality, as revealed by the microscope, of small round particles "in the wildest condition of commotion and movement," which, when collected in such a way as, by friction, to cause them to burst, yield a liquid that is known by the name of tar, will be news to many who have deemed themselves well informed upon the subject, although to gas makers it will not be a matter for surprise. It recalls, in fact, efforts that have from time to time been made to extract tar and oil from factory smoke, in the belief that herein may lie the satisfactory and profitable solution of the smoke nuisance. In directing attention to the danger of smoke during conflagration, since far more lives have been lost from suffocation than from actual burning, Professor Lewes passed to the practical side of his subject, and did good service by referring to the various forms of respirators employed for mitigating danger from this source. With regard to the causes of fire, it is useful to know that, according to the statistics of the large towns, matches are the most prolific cause, next to which come defective vents and flues or fireplaces, resulting in the overheating of beams and woodwork near them. Gas, oil, and candles make up between them a goodly number—gas ranking first, as was perhaps to be expected from its almost universal use.

Among the causes which contribute to danger from the use of gas, Professor Lewes gives prominence to swinging, or even fixed, gas-brackets placed between windows, where they are liable to come in contact with the curtains or other drapery; and sliding chandeliers, which are responsible for many explosions, owing to the evaporation of the water which forms the seal, or to the hardening of the packing which serves to keep the sliding tube gas-tight. There can be no good reason nowadays why this source of danger should not be greatly limited, by giving preference, as far as possible, to fixed chandeliers, or to fixed brackets which usefully distribute the light. That faulty fittings may cause leakage of gas goes without saying, and it emphasizes the necessity of the fitting up of houses being thoroughly well done; while the use of composition pipe is objectionable, since the driving of a nail may lead to an escape of gas. Mention is also made of the possible extinction of a small flame, such as that of a bye-pass, by a temporary reduction of pressure in the mains, although this, there is good reason to believe, is of but rare occurrence. Much less rare, probably, is the case of a consumer turning off the gas at the meter while a burner is still on, and leaving open the tap at the burner. This practice of turning off the gas at the meter is one for which there is seldom any necessity.

It is interesting to know that oil is accountable—notwithstanding its great displacement in recent years by the prepayment gas-meter—for nearly as many fires as gas; the actual figures for 1904, relating to London, Liverpool, Manchester, Glasgow, Leeds, and Sheffield, being: Gas 464, oil 408. For the same period, candles were answerable for 327. Clearly, then, the danger from these three artificial illuminants is not proportionate to their use; for, as pointed out by the lecturer, if the proportion per unit of light developed were taken, the risk for an equal amount of light from oil, for example, would be found to be enormously greater than from gas. Why this is so, is very lucidly described. But our interest mainly concerns gas; and whatever can be done to lessen the risk of fire from this source should tend to the advancement of the gas industry.

New Views on the Specific Heat of Gases.

IN the current and preceding numbers of the "JOURNAL" will be found a valuable communication from Dr. H. B. Harrop, of Milwaukee, on the specific heat of gases, more particularly of those normally present in the products of combustion of solid, liquid, and gaseous fuel—namely, carbonic acid, aqueous vapour, nitrogen, and oxygen. The temperatures attainable in such combustion, or the pressures resulting when the combustion takes place in closed spaces, as in internal-combustion engines, depends largely upon the value of the specific heats of the above-named gases; and an exact knowledge of their magnitude is therefore of the utmost importance. The first determination of these values was made some sixty years ago by Regnault; and until comparatively recently his figures were almost universally employed as representing the true value at all temperatures, though his determinations were carried out only at those up to about 300° C., and therefore far below the temperatures reached in combustion or explosion, and in spite of the fact that the investigator himself observed variations in the figures, even with the comparatively small range within which his experiments were carried out. The advent of the internal-combustion engine, however, as well as previous observations of Bunsen, soon showed that the pressures attainable in the engine cylinder were far below those calculated from the calorific power of the gas and Regnault's figures for the specific heat of the products of combustion; and to account for this discrepancy, the two well-known hypotheses were suggested—namely, either that dissociation takes place at the high temperatures brought about by the explosion, or that the specific heat of the products of combustion increases rapidly with the temperature.

While controversy still proceeds as to whether either of these suggestions affords the true explanation, it is generally admitted that the varying specific heat is—at any rate in part, although not entirely—the cause of the discrepancy. This hypothesis, especially associated with the name of Le Chatelier, has brought about a largely extended investigation of this subject by himself and many others; and, in his communication, Dr. Harrop gives an exhaustive and critical summary of all the available contributions that have appeared on the subject (many of them from publications difficult of access to most readers), as well as hitherto unpublished communications privately made to him; and from the most reliable of these results he has drawn up a chart giving curves from which the most probable value of the specific heat of each of these gases at any temperature up to 3500° Fahr. can be ascertained. Dr. Harrop in no way claims that these results are to be taken as final, for much more work is yet required, more particularly at intermediate temperatures; but he does claim that by the use of this table results will be obtained of much greater accuracy than is possible by the use of Regnault's numbers for all temperatures. Though the fallacy of the latter procedure has long been recognized by those investigating the theory and practice of internal-combustion engines, it must be acknowledged that in other departments of the gas industry this is by no means the case. Dr. Harrop himself has pointed out several recent important instances; and a glance through the back numbers of the "JOURNAL" shows many other examples—such as the various discussions which have taken place at the meetings of Gas Associations on the subject of gaseous firing and regeneration, in all of which Regnault's figures have been used throughout. A little inspection shows how materially the figures cited in such discussions are modified if the values given in Dr. Harrop's table are substituted for the older numbers.

A Rapid Increase and the Cause.

There is such a thing as modernization of administration, as well as of works, being required occasionally in connection with gas companies—that is to say, when the companies are allowed to be administered by rules which are held sacred to the memory of the founders of the concern, instead of improving and amending the lines of government with the fresh needs of new time. There was a danger at one period that the vitality of the San Paulo Gas Company would be sapped solely owing to the time-honoured management in London. Fortunately for the shareholders, one by one changes were effected in the management. Among them, Mr. D. M. Fox took the chair; Mr. A. F. Phillips becoming the

Managing-Director. A new contract was made with the Government in 1902; and the Board took advantage of this—in view of the incandescent gas-burner and the use of gas for cooking—to lower the illuminating power of the gas to 14 candles, and to make, as this assisted them in doing, a considerable reduction in price for both private and public lighting. What has been the result? Last year the amount of gas sold (note the figure) was 55 per cent. above the quantity sold in 1901, which was the last complete year's working under the old contract. Since, therefore, the reductions in illuminating power and price, the use of gas, despite the keen competition of electricity, has gone up in a manner never before experienced by the Company, and never before probably anticipated. The financial position of the Company has been greatly strengthened; the dividend just declared for last year is 8 per cent., as against 7 per cent.; and altogether there is room for the utmost satisfaction on the part of the shareholders. The growth of business, too, is proof of the satisfaction of the citizens with the commodity the Company are now supplying for incandescent lighting, cooking, and other purposes. The Company offer an excellent lesson as to the advantage that accrues from having an administration who are able to appreciate what the times require, and, appreciating, set about making the provision. It will be also noted that the Company's dealings in residual products exhibit good results. Regarding the Company's outlets for tar, unfortunately in this country we have no coffee planters who require that product; and local authorities are slow in putting tar so fully to use in road work as would be beneficial to the public in view of the changes in the character of vehicular traffic. The retail business in these directions the San Paulo Company are energetically developing on their own account.

Trade Unions and the Law.

The promised introduction into Parliament yesterday afternoon of the Government Bill to deal with the vexed question of trade disputes, led to some revival of interest on the part of the general public in a matter about which they had no doubt become tired of hearing. But the importance of the subject has never for one moment been lost sight of by those who are directly concerned—that is, trade unionists and employers of labour. Only a few days ago a deputation impressed upon the Government the necessity of giving due consideration to the employers' side of the question; while as for the trade unionists, they have, by means of the Press and the public platform (to say nothing of the two Bills dealing with trade disputes that have already been introduced in the present session of Parliament), continuously kept their aims and arguments well in the foreground. Only in last Friday's "Daily Chronicle" there appeared a lengthy article by Mr. Clement Edwards, the Liberal and Labour Member for Denbigh District, in which the writer puts forward the case in favour of a reversal of the law as laid down in the celebrated Taff Vale case. Such a course, he contends, would merely place the Unions in the position which Parliament intended they should occupy, and would not place them "above the law." On the contrary, he says, at present they occupy an exceptional and anomalous position; for they are not corporations, partnerships, or individuals. By the Taff Vale decision, they are saddled with the liabilities of corporate bodies; but by the operation of the fourth section of the Trade Union Act, they are at the same time deprived of the rights, immunities, and privileges of a corporate body. This is the "anomalous situation" from which Mr. Edwards desires to see the Trade Unions extricated, by the removal from them of the liabilities, or the bestowal on them of the rights, of corporate bodies. In other words, if the Taff Vale decision is to stand, the Unions must have granted to them power to enforce payment of subscriptions against defaulting members, just as corporate bodies have a right to do. This, it may be, would open up a new method of procedure; but we fancy, from cases that have come to light at different times, that even at present the Unions are by no means without the power of inducing recalcitrant members to "pay up." However, Mr. Edwards regards this suggestion that Unions should be compulsorily converted into fully-fledged corporate bodies as most unwise and dangerous; and therefore he favours the putting back of Trade Unions into the ante-Taff Vale position. This, he says, is the position occupied by clubs (unless they are joint-stock companies) and political associations; no one having ever suggested that the funds of such organizations could be made liable for the torts of their officers or committeemen. The cases will not strike everyone as being precisely analogous, inasmuch as the officers and committeemen of either clubs or political associations have not got it in their power to cause such widespread disaster as may easily follow upon a hastily adopted line of action by a Trade Union official.

Where is Municipal Trading to Stop?

The above inquiry was suggested on reading the "Memorandum" attached to the Bill introduced by Mr. Chiozza Money, the new member for North Paddington, to enlarge the powers of local authorities. Many people think their powers are already quite large enough—in fact, that they mix themselves up with matters which are extraneous to their legitimate functions. But Mr. Money and his "backers"—among whom is Sir Charles Dilke—are evidently of opinion that their operations are confined to far too narrow limits; and their view is shared by not a few of the gentlemen who find themselves for the first time at Westminster engaged in law-making. It will be seen from the summary of the Bill given elsewhere that it proposes to confer upon local authorities powers in respect of the purchase of land, the building of houses, and especially the acquisition or establishment of trading undertakings. It in no way touches questions of taxation or finance; the powers of municipalities in these respects being left exactly as they are at present. Generally, the Bill frees them from the necessity of going to Parliament for authority to enter into new enterprises. Under the powers it confers, a local authority will be able to acquire or establish and carry on, within or beyond their area, a traffic, manufacturing, commercial, banking, insurance, or any other business or industry whatsoever. The Bill vetoes the sale of any business carried on under its provisions to any but another local authority. It is provided that any rent, profits, or interest arising from land, buildings, or businesses acquired or established under the Bill are in the first place to be applied to the repayment of any capital which may be borrowed for its purposes. We shall watch with interest the progress of the measure.

Gas Supply in Germany and Warsaw.

In view of the internal troubles which have afflicted with more or less severity the whole of the Czar's dominions, it is certainly not surprising to find that the essentially peaceful industry of gas manufacture and supply suffered to some extent during the past year in the capital of Russian Poland. To Warsaw, the German Continental Gas Company look for the sale of more than 50 per cent. of their gas; and it is stated in the annual report (a translation of which the usual kindness of the General Manager, Herr W. von Oechelhaeuser, enables us to publish to-day) that the make of gas there during 1905 showed a decrease of 5·08 per cent. as compared with the preceding twelve months. This was, however, more than counterbalanced by an increased output from the Company's various German works amounting to 6·21 per cent. so that the whole of the operations resulted in a slight gain of 0·31 per cent. This achievement, comparing as it does with a small decrease of 0·67 per cent. in the total output of the previous year, cannot, under the peculiar circumstances of the case, be regarded otherwise than as satisfactory. Indeed a much greater falling off than was actually experienced in the consumption at Warsaw would not have been at all surprising; and it would doubtless have taken place, had it not been, as the report says, for the ready support of the Russian authorities and the exemplary devotion of the Company's Manager at Warsaw (Herr Otto Alberti) and the other officers. Though the gas workers joined the general strike that occurred in Warsaw, an uninterrupted supply of gas was maintained by the aid of soldiers sent into the works for the purpose; and thus the inhabitants were not forced, as was the case at both St. Petersburg and Moscow, to do without gas at a time when they were no doubt most pleased to have it. Though the profit of the Company for the year was nearly £14,000 less than that for the preceding twelve months, there is to be no falling off in the dividend. This will make the fifth successive year for which the return to the shareholders has been at the rate of 10 per cent. The report announces an increase, for the purposes of extensions, in the capital of the Company; and it also naturally contains some references to the subject of vertical retorts.

NOTES FROM WESTMINSTER.

THE second week of the sittings of Select Committees has passed; and things are moving forward in a most leisurely way. On all hands, however, there are indications of a disposition for parties to mutually settle differences without incurring the expense of a contest of unknown length. This is not only so in connection with gas and water measures, but also in other departments of public work for which parliamentary powers have to be procured. We have already seen how the Bills in Group A which Mr. Tennant's Committee had under consideration were thinned out by the process of the mutual solution of differences; and they are now only waiting to see whether they will be needed to investigate the requirements of the parties concerned in the Rochester, Chatham, and Strood Gaslight Company's Bill. If they are, as at present arranged, they will meet for the purpose to-morrow. They have disposed of the Merthyr Tydfil and Dowlais Gas Bills; and the interesting points raised upon them are noted below. Two of the Bills that were withdrawn from the consideration of the Committee were those of the Uxbridge and Watford Gas Companies; and they will now go forward unopposed. In regard to the Uxbridge Bill, the only petitioners with whom there was not a settlement was the West Suburban Gas Company; and they did not put in an appearance. It is to be regretted that any costs involved through such action cannot be shifted on to their shoulders. In the case of the Watford Bill, the Company originally had the County and Local Councils against them; but by striking out the proposed new territory and the electric supply clauses, and conceding points on minor matters, they were also saved a contest. In the Lords, agreement also eliminated from the list of the Committee to whom they had been referred the Accrington Gas and Water Board's Bill and the Holyhead Water Bill; while the Fulwood Water Bill has, after discussion, been withdrawn. The consideration of the Wolstanton Gas Purchase Bill was commenced in the Lords on Friday by Earl Cawdor's Committee. This is a case over which there can only be discussion on details, seeing that the promoting Council are purchasing the Chesterton Gas Company's works by agreement, and so much of the mains and other works of the Corporations of Burslem and Newcastle-under-Lyme as are within the urban district of Wolstanton, under empowering sections contained in Acts obtained by the two Corporations in 1877. The Councils are both in opposition; and the proceedings, being when writing, uncompleted, will be noticed next week. Several Bills have been before the Unopposed Committee; and out of them came two or three interesting points, which are referred to in succeeding notes. There is now talk of the Cardiff Gas Company's Bill being opposed in the second House by the Caerphilly Council, on the ground of unfair treatment; but whether this will come to anything, in view of the settlement with the Cardiff Corporation in the Commons, cannot yet be stated. No further Committees were appointed during the week to deal with gas or Water Bills. With regard to the London Electric Power Bills, it is known that the Government have been divided on the subject of the rejection on second reading of the privately promoted measures in favour of the Bill of the London County Council. There are those of the Government—Mr. Asquith and Mr. Haldane, for instance—who hold that the whole of the Bills should be sent to Committee; while the President of the Local Government Board is said to have shown strong aversion to any but the County Council scheme going forward. It is all a question as between private enterprise and municipal trading; and that ought not to be. The Bills were introduced for second reading last night, with the result that the County Council Bill was referred to a Hybrid Committee, which will consider the whole question of the supply of electricity in bulk in the Metropolitan area. The other Bills were postponed.

A Labour Committee-Man. A full day was spent on the Merthyr Tydfil Bill on Monday; and thereafter it went on piecemeal until Thursday morning. The able and fair-minded manner in which Mr. H. J. Tennant presided over the Committee was fully recognized by all in the Committee room; but his duties had to be occasionally varied, unfortunately, by a little remonstrance addressed to the Labour member of the Committee, Mr. John Hodge. This gentleman has a noticeably brusque manner, and an exceedingly strong point of view of the pro-municipalistic order; and he has taken up his duties at Westminster with the notion that they, in and out of season, demand that he shall give expression to his municipalistic doctrines. Not only did he do this during the proceedings on the Merthyr Bill, but he treated witnesses for the Company to a species of interrogation which showed that he has not yet grasped that the fundamental duties of a Parliamentary Committee-man are judicial and not partizan. Perhaps time will improve his knowledge in this respect, and, also perhaps, rub off some of the sharp corners that he has developed before coming to Westminster to take part in the work of the nation. At present, after his exhibition in Committee, Mr. Hodge is only seen as a man incapable of dealing with an open mind with issues to which a private company and a municipal authority are the parties. It was very noticeable that the witnesses for the Corporation were not treated to the annoyance and (we have no hesitation in saying) insult to which Mr. Corbet Woodall and the Chairman of the Company (Mr. H. P. Linton) were subjected.

A Suspensory Clause. Having made this protest, a few words as to the proceedings. As the evidence continued, it became more and more evident that the Corporation had little ground for complaint as to the manner in which the Company had conducted their business; and several local witnesses followed one after the other to the chair, and declared their satisfaction with the way the Company had fulfilled their obligations to the consumers. Mr. E. W. Drew had submitted the accounts to a most searching examination, with the object of showing that, if the Company had charged certain expenditure to capital instead of to revenue, and had not done other things, they would have been in a position to charge the consumers so many more pence below the 2s. 10d., which is the present price. The thing that struck one most about Mr. Drew's evidence was that, for the Company to have done all he said they ought not to have done, and yet be able to supply at the figure named above, was a splendid testimony to skilful management. Supposing the Company had charged all the money that he made out they should have entered against capital, then there would have been so many more pence required per 1000 cubic feet perpetually to meet the dividend on the capital; and to that extent his calculations, as well as the price of gas, would have suffered. While we are not advocates of incorrect methods of account-keeping, at the same time the consumers of Merthyr will year by year reap the benefit of what has been done, and especially if the Company continue in existence, and the sliding-scale is brought into operation—inuring to a fair adjustment of the permanent relations between the shareholders and the consumers, in a manner that would not obtain under municipal management. Purchase was the subject of a large part of the discussion. This is a statutory Company, and the Corporation were asking for the establishment of a fresh precedent in the infliction of a compulsory purchase clause. It may at once be said that they did not get it, but all they did obtain was a clause which practically maintains, as it were, the condition of things antecedent to the promotion of the present Bill (excepting in regard to the expenditure of capital for defined pressing purposes), in order that the Corporation and the Company may meet and fight out the question of purchase on a Bill to be specially promoted by the Corporation next session. In other words, the operation of the Company's new Act will be suspended for a session, except as specified. This clause, it will therefore be seen, is an altogether different thing from a purchase clause. Of course, there was a good deal of postulation on the part of the witnesses for the Corporation as to the better position the consumers would be in if the Company were handed over to the Corporation; but there was one local witness who said he was sure the ratepayers would vote against purchase—the Corporation having quite enough to do at the present time, and quite sufficient financial engagements with which to wrestle. It seems that, in addition to the Merthyr Tydfil Company, the Dowlais Company and one or two other small concerns supply in the Corporation's area; and there is a new-born desire on the part of that body that all these concerns should be brought under their management, in order to secure the economies that concentration would afford. A uniform price throughout the district was spoken of; and, if this comes to pass, it is not altogether improbable that the Company's consumers who are the best off now might peradventure not find themselves in such a good position when the process of price-levelling had been accomplished. But after all, whatever benefits could be obtained by concentration under municipal management could be secured by the amalgamation of the Companies, and the sliding-scale would offer the consumers a protection greater than they would have under Corporation administration. During the proceedings, the Company conceded a reduction of the additional capital asked for in the Bill from £60,000 and one-third borrowing powers, to £45,000 and one-third. They also offered a 2s. 10d. standard price in place of the 3s. proposed in the Bill. The Corporation wanted 2s. 8d. The Chairman suggested the adoption of the "arbitration principle" (which it is to be hoped is not often applied) of splitting the difference. The learned Counsel admitted that it was a short cut out of the controversy; and so the standard price is to be 2s. 9d. Mr. W. A. Valon and Mr. Charles Hunt were among the witnesses for the Corporation; those who appeared for the Company were mentioned last week.

The Dowlais Bill. Between the Merthyr Tydfil Company's Bill and the Dowlais Gas Company's Bill, there was a relationship, as the Merthyr Tydfil Corporation were also seeking a purchase clause in this case. Seeing that it is a non-statutory Company, who were not offering any great resistance to the imposition of the clause, there was not much difficulty in agreeing, before the Committee, upon the insertion of one. The only thing was the Company required the Hitchin clause, which contained (the ratepayers, with great prudence, in that case rejected the Council's proposal to purchase) a direction to the Arbitrator to allow 10 per cent. compensation for compulsory purchase; but they gave way on this, on the Corporation agreeing to allow them half of a discount of 25 per cent. on the issue of £10,000 additional capital which had to be raised some time since to provide for the demands of their district. The standard price of gas was also reduced from the proposed 4s. to 3s. 6d.—likewise by agreement. The price for public lighting is not to exceed 3s. 3d.; provision is made for the compensation of the Manager (Mr. D. Jones) in the event of him retiring, should the concern pass into the hands of the Corporation; and capital

expenditure for works and distribution improvements is arranged for pending the settlement of the Corporation's purchase scheme. The Chairman again in this case exhibited his powers as a peacemaker; and as the details in dispute were smoothed out one by one under his advice, there was really nothing left for the Committee to adjudicate upon.

Thirteen Candles. In the opening paragraph, it was stated that the Watford Bill is now going through unopposed. This is one of the Bills of the session proposing a reduction of illuminating power to 13 candles, being, in this case, a drop of 2 candles. Unless something unforeseen happens, Mr. H. E. Jones will be the first to obtain advantage from the exertions in recent sessions to show Parliament that illuminating power has no particular virtue in these days of incandescent gas-burners. The standard price in the Bill was 4s. 3d. The Company were willing to forego 1d. of this; but the Unopposed Bill Committee of the Commons favoured 1d. per candle. The initial price is therefore to be 4s. 1d.

Prepayment Meter Clauses. The proceedings on the Thornton Bill before the same Committee show that there is still anxiety to make the application of the prepayment meter clauses, as far as possible, uniform. We cannot see why Sir Chandos Leigh should have suggested in this case that the rent for a prepayment meter without fittings should be 5d., seeing that 6d. was the common figure last session. The suggestion may have had some bearing upon the standard price of 4s. 6d. However, 6d. is allowed.

Suction and Other Power Gas Plants. Owners of suction and other power gas plants in the Mirfield Gas Company's district will not, on the Company's Bill passing through Parliament, be able to use at will the ordinary supply of gas merely as a stand-by, to tide over any accident to private plants. It is a system of one-sided protection that is becoming all too common among manufacturers. The Company, therefore put a clause in their Bill exempting them from the obligation of supplying for power purposes to engines attached to private power or suction gas plants, unless it could be done without detriment to their ordinary and power consumers. When the Bill was before Lord Onslow, on the suggestion of his Counsel (Mr. Albert Gray), the clause was extended by the inclusion of the words "except after 24 hours' notice from the consumer on each occasion," and then he can only expect a supply when it can be given without affecting the ordinary supply. The manufacturer in a district where such a clause as this comes into force will have to reconsider his position, as few manufacturers will care, or can afford, to run risks of stoppage for even 24 hours.

Fulwood Water Bill. The Fulwood District Council are not so badly off for water as they imagined when they determined to come to Parliament in this session for powers to carry out additional works on the Burnslack stream; the scheme being estimated to cost £26,000. Coming to Parliament, however, is a costly way of finding out the truth. The Bill was before Earl Cawdor's Committee during two sittings last week; and Lord Derby and Miss Weld, owners of estates on the stream in question, were represented in opposition. It transpired that the consumption of water in the district per head per day was 40 gallons; and the Council were strongly advised by the opposition to save the waste and so capital expenditure on new works at the present time. The promoters saw the wisdom of the advice, and withdrew the Bill. A water undertaking that allows the use of 40 gallons per head per day cannot be in sore straits.

Mr. E. H. Swain, of Bingley, has been appointed Gas Engineer and Manager to the Pontypridd Urban District Council, in succession to Mr. E. Jones, who, as our readers are aware, has gone to Burslem.

Out of 68 applicants for the post of foreman at the Dumfries Corporation Gas-Works, the Gas Committee have appointed Mr. J. M. Smith, who is a son of Mr. J. Smith, the joint Manager of the Gas-Works at Hawick.

We learn from "Nature" that the Secretary of the Decimal Association has lately received 53 promises of support from newly elected Members of Parliament. In the last Parliament there were 330 members pledged to support the adoption of the metric weights and measures in this country, and at the present time 253 votes can be relied upon in the House of Commons. Additional assents are being received day by day; and it is considered probable that when the canvass now proceeding has been completed, there will be as many supporters in the present Parliament as there were in the last.

Messrs. Schultz, Comins, and Co., chartered accountants, of 50, Cannon Street, E.C., have carried through successfully an appeal before the Special Commissioners whereby they secured for the Ascot District Gas Company an abatement of 3 per cent. in respect of depreciation of plant, machinery, &c. Hitherto surveyors have resolutely refused to make any allowance whatever; contending that, as gas companies keep their plant in good condition out of revenue, they are not entitled to further allowance for wear and tear. The decision in the Ascot case will be of the utmost value to the gas industry.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 876.)

Business on the Stock Exchange last week was for the most part very quiet. So far as any general tendency could be detected, it was rather fitful and capricious—taking at one time a favourable turn, and then receding again. The prospects of foreign relations are brightened by the promise of a not far distant settlement of the Moroccan imbroglio; but home affairs are outside the ray of its light. In the Money Market, after an easy opening, the position steadily hardened; and it remained firm almost up to the close. Business in the Gas Market was quieter than during the preceding week. It was no better than moderate on the first few days; and in the last half of the week it fell away to very slender proportions. The general tendency, however, remained unimpaired, and several quotations made more or less considerable advances; while only one or two in a special line showed a small shrinkage. In Gaslight and Coke issues, the ordinary was very steady; all transactions being marked within the same range of prices as had obtained the previous week—viz., 98½–99⅓. A moderate amount was done in the secured issues, also at good steady figures. The maximum changed hands at 89¾, the preference at 108¾ to 109½, and the debenture at 89 and 89½. Business in South Metropolitan was about on a level with that of the week preceding, and at the same prices; transactions ranging from 128 to 129. Commercials were again a very quiet market. Nothing was done in the 4 per cent., one bargain was marked in the 3½ per cent. at 112½, and one in the debenture at 85¼. In the Suburban and Provincial group, there were but few dealings, but a large number of issues improved in quotation. Brentford old marked 265 and 266 (a rise of 3), Bournemouth "B" 16⅞, Brighton original 231, Tottenham "B" 102, and North Middlesex 20 (a rise of ½). British, Bromley "A," and West Ham ordinary and debenture advanced in quotation, but were not dealt in. In their local Exchanges, Liverpool "B" and all three Sheffields advanced; the latter now being in the proud position of an even 4 per cent. price. In the Continental Companies, Imperial was a point easier, with business marked at from 234½ to 232½, ditto debenture marked 96½, Union was a point easier at 130, ditto preference was done free at 145, and European part-paid changed hands at 17⅛ (a rise of ½). Tuscan was done at from 10 3/16 to 10⅜. Among the undertakings of the remoter world, Bombay was done at 6⅞ and 7, Oriental at 150½ (a rise of 1), Cape Town at 17¼, Buenos Ayres at from 12⅝ to 12⅞, Primitiva ordinary at 7⅛ and 7 3/16, ditto preference at from 5 3/16 to 5 5/16, River Plate at from 13 3/16 to 13 5/16, and Monte Video at 12.

The closing prices are shown in our Stock and Share List on page 876.

ELECTRIC LIGHTING MEMORANDA.

An Electric Lighting Controversy in Sydney—A Dogmatic Town Clerk—Plagiarism and the Suppression of Facts—Information and an Offer of More.

Controversy over gas and electric lighting has been running high in Sydney, just as it has been doing in London; and one result of it is that we have before us, from a local paper, a little sheaf of verbose articles, the author of which is Mr. Thomas H. Nesbitt, the Town Clerk of Sydney, N.S.W. The Chairman of the Australian Gas Company (Mr. G. J. Cohen) publicly made a statement lately that London "has discarded electricity for gas." There is truth in the statement; but it needed qualification by some such words as "to an extent." Perhaps a better way for Mr. Cohen to have put his statement would have been to say that the tendency in London, other than in those districts where the electrical undertakings are the property of the municipalities (who, to make revenue for their undertakings, foist considerable installations of public lighting on the ratepayers), is decidedly in favour of street lighting by incandescent gas-burners, as is illustrated by the contract which has caused incandescent gas-lamps to supersede some 50 arc lamps in the City (which is generally called, for the sake of peace, "an experiment"), by the new lighting of the bridges, by the new lighting of the forecourt of Buckingham Palace, by the new lighting round the Houses of Parliament, by the lighting of Whitehall, Parliament Square, Aldwych and Kingsway, by the lighting of the new Victoria Station of the Brighton and South Coast Railway, by the lighting of Broad Street Station, by successes in competition with electricity in other situations, and lastly by the fact that there are to-day in the streets of London between 70,000 and 80,000 gas-lamps, of which the greater part are incandescents, as compared with 7000 to 8000 electric lamps, or about 1000 electric lamps (including the poor incandescent electrics) for every 10,000 gas-lamps. Mr. Nesbitt, Town Clerk, is the servant of a Municipality interested in electricity; and Mr. Nesbitt therefore takes up the cudgels on their behalf. He does so by antagonizing his readers by the character of the language he employs, by an undue exposure of his prejudice, and to those who know the worth of what he is saying, by a grotesque assumption of personal knowledge of the matters upon which he is writing, or, where he does not care to father statements, by referring to the "excellent authority" and "reliable sources" on the strength of which he makes assertion.

We have here a gentleman to deal with who is evidently all too well satisfied with himself.

It would, in the first place, be immensely interesting to know what are the qualifications of the dogmatic Mr. Nesbitt for sitting in judgment upon us. He advises Mr. Cohen—in a manner unbefitting a Town Clerk—to "obtain more reliable information than that contained in the columns of the 'JOURNAL' and the 'Gas World,' *which have never yet been distinguished for accuracy.*" When proper use is made of the information contained in the "JOURNAL," it will be found—judging from the character of the matter presented to his readers by Mr. Nesbitt—to be equally, if not more, distinguished for its accuracy than that of the "authorities" and "reliable sources" on which Mr. Nesbitt so fully and implicitly relies, though he has not the courage to disclose who are the "authorities" and the "reliable sources," as, by so doing, he would show how far they conform with his description. Saying which, we accuse Mr. Nesbitt of, in his articles, both plagiarism and the suppression of material facts. We are sorrry that his amiable intention of bringing disrepute on the accuracy of the "JOURNAL" should compel us to go a step further, and expose his second-hand manner of dealing with these questions, without proper acknowledgment. The journalists of the Sydney "Daily Telegraph" will appreciate the point, if the Town Clerk cannot. Two or three instances will suffice. He speaks, in one place, of the flame arc lamps opposite the Mansion House in the City of London. Compare the wording of these statements, one of which was published six months ago, and pirated by him with the greatest coolness:—

These lamps, I am informed on excellent authority, actually cast on the ground a shadow not only of the gas-lamp itself but also the fumes arising from the multiple mantles employed in it. I have also received information that the maintenance of this gas-lamp costs the Corporation £64 per annum. This must appear to anyone possessing but an elementary knowledge of the subject an excessive figure; but if it is really accurate I have no shadow of doubt as to the result of a comparison between the two methods of illumination if made under fair conditions. Notwithstanding the efforts on the part of the Electric Light Company, the Company were requested to remove their 47 arc lamp-posts in the streets in which incandescent gas lighting has been decided upon, and the Company very strongly protested against this action.—*Mr. Nesbitt, Feb.* 6, 1906.

These lamps, which can be seen any evening, actually cast on the ground a shadow not only of the gas-lamp itself, but also of the fumes arising from the multiple mantles employed in it. We have been informed that the maintenance of this gas-lamp costs the Corporation £64 per annum. This appears to be an excessive figure; but if it is really accurate, there can be little doubt as to the result of a comparison between the two methods of illumination made under fair conditions. Notwithstanding the efforts on the part of the Electric Lighting Company, the Company have been requested to remove its 47 arc lamp-posts in the streets in which incandescent gas lighting has been decided upon, and we trust that the Company's protest against this will have proper consideration. — *Electrician, Aug.* 4, 1905.

"I am informed on excellent authority," writes Sydney's Town Clerk. How much will the people of Sydney, after this quotation, give for the excellence of Mr. Nesbitt's authority? And that gentleman, if he had only the knowledge of a tyro in these matters, would have been ashamed to have adopted such an idiotic assertion as to visible "fumes" coming from the mantles, as well as the statement as to the £64. "Subsequent advices from reliable sources inform" Mr. Town Clerk that the "experimental installation of incandescent gas lighting in the City of London has been celebrated by a display of 'mafficking'" on the part of the "JOURNAL." "Mafficking" is an expression that was used now many months ago by a serio-comic writer in one of the electrical papers—another "reliable source." But what necessity was there for Mr. Nesbitt to say on Feb. 8 that "subsequent advices from reliable sources" informed him, when in a later letter he says that he "regularly" reads the "JOURNAL"? and the "mafficking" took place in our issue for Oct. 10 last. This looks suspicious. But as to incandescent gas lighting being established in only a "few" streets in the City, Mr. Nesbitt will learn, on "reliable information," if he applies to the officials at the Guildhall of the City of London, that in the celebrated square mile there are something like 3000 incandescent gas-lamps now, as compared with 450 or so electric arc lamps. We should not like him to take the fact from our polluted columns, without verification. One more instance of the Town Clerk's slavish preparation of his letters from electrical sources.

It is freely asserted, and until the particulars are furnished I accept the assertion, that the Gas Company's terms are under cost; and this is a disability from which it is the duty of the London Gas-light and Coke Company and the gas organs, or the Chairman of the Australian Gas Company, to free such advocates if possible.—*Mr. Nesbitt, Feb.* 8, 1906.

At present they are unable to meet the assertion that the Gas Company's terms are under cost; and that is a disability from which it is the duty of the gas organs to free them if possible.—*The Electrical Times, Oct.* 19, 1905.

Now our "regular" reader—Mr. Nesbitt—not only did us the injustice of overlooking our "mafficking," but also the details (as required by the "Electrical Times") in the "JOURNAL" for Oct. 24 and Oct. 31, upon which publication the electrical press has been discreetly silent. Perhaps Mr. Nesbitt will explain how he came to overlook the things, being a "regular" reader. As he is a "regular" reader, we repeat our accusation against him of the suppression of material facts that were, or ought to have been, in his possession. Certainly his articles reveal the diligence with which he has read, and extracted from, the electrical papers.

The Town Clerk's absurdities and distortions are too many to waste time over them all; but as he seems to know more about the City of Westminster than any other part of London, we will take that particular portion of his articles for further notice. He says that the electricity supply of the City of Westminster is by Companies, "and the *greater* portion of the City, including the Strand, is lighted by electricity." Now what are the facts? The electric lamps in the city total to rather more than 1000, and the gas-lamps to over 3000. But the Town Clerk does not tell the readers of the Sydney paper in which he spreads himself out, that the Westminster City Council would be very glad to be relieved of the legacy of the late St. George's Vestry of a large contract for street electric lighting at an enormous price. Nor does he tell his readers that the area now governed by the Westminster City Council was at one time (1888-9) lighted for £22,393; but that electricity afterwards came into use to the extent mentioned above, and, almost wholly owing to this, the cost in 1903-4 was £43,895, and by this time is no doubt more. Mr. Nesbitt does not speak of the *recent* installations of high-pressure and ordinary incandescent gas lighting in the City of Westminster. Perhaps the "reliable sources" failed him in this respect. But he does make much of the fact that the St. James's and Pall Mall Electric Supply Company succeeded some months ago in retaining a small contract, on a petition signed largely by certain of the Electricity Company's principal customers in Regent Street. He does not, however, say that the Electricity Company's price had to be reduced from £30 to £17 per lamp per annum; that the Gas Company offered to supply the same (900) candle power lamps at £15 1s. per annum, but this involved an expenditure of £10 per lamp for conversion; that since the contract was made with the Electricity Company, there have been complaints in the City Council as to the Company not working up to their contract illumination; that several of the principal members of the Westminster City Council spoke strongly, during the discussion of the contract, in favour of incandescent gas lighting—including Mr. Spencer-Smith, the Chairman of the Works Committee. If we dared to do so, we would ask the Town Clerk of Sydney to turn to an article elsewhere in this issue (p. 855) to learn something of the scandalous waste of ratepayers' money that there has been in London on public lighting since the adoption of electricity on a comparatively modest scale. After doing this, if he would like a few more facts, we shall be exceedingly pleased to accommodate him, on the one condition that he will screw up sufficient courtesy to accept, and (if he will) put them to the test in proper quarters, before accusing us of inaccuracy. Our honesty will certainly match Mr. Nesbitt's. To say the least, that gentleman must fancy himself on a high pinnacle, and his readers at the base, when he expects them, on his bare assertion, to believe that the "JOURNAL" has "never yet been distinguished for accuracy."

Since writing the foregoing, further articles have come to hand which evidently for the time being exhaust Mr. Nesbitt's information. These articles are a hash-up of information published or supplied by electricians, mixed with statements that are grossly inaccurate. As no doubt Mr. Nesbitt has by him the files of the "JOURNAL," seeing that he regularly reads it, it would not have been an injudicious proceeding on his part to have read what has already been stated in our pages on much of the stale matter that he serves up to his readers. With that kind of civility which is apparently characteristic of him, he refers to the statement of the Gaslight and Coke Company that "gas at 2s. 11d. is equal to electricity at ½d. per unit" as a "mendacious" one. We will only ask him to look back at the "JOURNAL" for Aug. 22 last, p. 489, and he will find something there that will interest him. With a fine display of his ignorance of these matters, he quotes extensively from the reports of electricians who have adopted the new notion of taking the nominal—not the actual or the effective—candle power of lights, and the cost, and working out the price paid per candle-hour. This piece of absurdity has been exposed over and over again. The great candle power of such centres of light as arc lamps, is largely wasted by its concentration; and the only true test of the economy of one system over the other is the cost of efficiently lighting (say) a mile of roadway. If electric lighting is so much cheaper than incandescent gas lighting, how is it that where electricity is adopted for street lighting, the annual cost leaps up in the manner shown in the article elsewhere? In his last article, Mr. Nesbitt states that Woking never had any public lighting. That is certainly a "mendacious" statement. The contract of the Electric Light Company for 123 public lamps expired in 1901. He says the same thing of Norwich. There are both arc and Nernst lamps in the city to-day; but the Corporation are so well pleased with the economy and efficiency of the incandescent gas system that, on the experience of their own lighting and that of the Gas Company, they are content not to make further change, and the municipal praise of what the latter Company have done in the lighting of the streets has been frequently heard. The Sheffield Corporation are wise in not wishing to land the ratepayers in greater expense for public lighting than efficiency demands, though the Electrical Engineer has struggled hard to get them to give him the custom. In the city of Liverpool (the last report of the Lighting Inspector shows) there are only 4½ miles of streets lighted by electricity; as against 426½ miles

by incandescent gas. And the city are still converting flat-flame lamps to the latter system. The ratepayers of Sydney will smile over these official figures after their Town Clerk's denunciation of the wicked gas companies. Mr. Nesbitt will do us a favour if he will point out where this "organ" has ever stated that electricity is not used for public lighting in Liverpool. We did report a meeting of the Council of the city in 1901, at which it was decided not to make an extension of electric lighting on the ground that it was more economical to light by incandescent gas-burners. Islington has its own electricity undertaking. The cost of lighting its streets in 1888-9 by gas was £12,651; in 1899-1900, £24,127; in 1904-5, £34,367. The ratepayers of Sydney should also mark this increased cost with the adoption of electricity; for truly there is "no sign of retrogression" in expenditure here. We compliment Mr. Nesbitt on the assiduity he has shown in collecting statements emanating from electrical sources, but cannot congratulate him upon the prejudiced manner in which he has presented what he has gleaned without going to the trouble of seeing whether there is not another side to the tale.

STEAM MOTOR-WAGGONS.

Automobile Exhibition at the Agricultural Hall.

In the Minor Hall of Cordingley's Eleventh Annual Automobile Exhibition, which was opened at the Agricultural Hall last Saturday, and which closes on the 31st inst., are grouped together nearly all the heavy industrial vehicles. There are about a score of motor waggons and lorries driven by steam, and the fuel for which is gas coke. Among them are some new designs, and also some new comers as exhibitors or manufacturers of steam-waggons —such as Messrs. Beyer, Peacock, and Co., Limited, the locomotive builders, of Manchester, Messrs. Alley and M'Lellan, Limited, of Glasgow, and Messrs. Bretherton and Bryan, of Willesden Green. It will thus be seen that, though for pleasure or omnibus purposes petrol offers several advantages as motive power, nevertheless the adoption of steam is even extending for many industrial waggons. Some of the reasons for this are to be found in the greater reliability, durability, simplicity, and what may be called the elasticity of the steam vehicle. A further big advantage is the lower running cost of a steam-waggon compared with one driven by petrol; some calculations putting the cost of the former at about half that of the latter. For gas-works purposes, there can, of course, be no doubt as to which source of power is the more advantageous; and therefore a glance at some of the steam-waggon exhibits may not be without utility.

The 5-ton tipping-waggon seems to be the recognized standard size, for practically all the makers exhibiting show a vehicle of this capacity. The first stand on the left is that of the Yorkshire Patent Steam-Waggon Company, of Hunslet, Leeds. Their type of waggon is well known, with double-ended locomotive boiler, and compound engine with cylinders 4½ in. and 7½ in. diameter by 7½ in. stroke. The transmission is by spur-gearing, with two speeds, of either 2½ or 5½ miles per hour. All working parts are enclosed, and the back axle has special sliding bearings to relieve the body of the waggon from undue strain over rough roads. The tipping is effected by hand and twin-screws. The cost of running, including everything, may be taken at about 2d. or 2½d. per ton-mile. We believe that both the South Metropolitan and the British Gas Companies have vehicles of this make at work. Fodens, Limited, of Sandbach, take up one side of the hall with their exhibit of three 5-ton waggons. They are of the traction-engine type, with horizontal multitubular boiler, having a compound engine on the top. Welsh coal is more generally used in this vehicle; but gas coke can also be employed. The weight of the waggon unloaded is 4 tons 18 cwt. It is said that these waggons will convey goods at a saving of 50 per cent. over horse haulage. They can be fitted with tipping bodies, which add about £25 to the usual price of about £550. At Stand No. 177, Messrs. E. S. Hindley and Sons, of Bourton, Dorset, show a 5-ton lorry with flat platform, and a 3-ton waggon with tipping body. A special feature of this machine is the patent stayless locomotive boiler, which obviates the uncovering of the water-tubes when ascending a hill. The outer fire-box casing is in this boiler carried up much higher than the top of the barrel, which is always kept full of water. Either gas coke or steam coal can be used; the fuel being fed at the top. The water-tank holds 180 gallons, which is enough for a run of 15 to 20 miles. At the next stand, Carter's Steam-Waggon Company, of Oakenrod, Rochdale, exhibit their design of 5-ton tipping waggon, the characteristic point of which is that it has an inverted vertical compound engine, of 35 brake-horse-power working at 450 revolutions per minute, and 200 lbs. steam pressure. The boiler is of the vertical fire-tube type; the tubes being of curved pattern. There is a single chain drive on to a live axle. This may be contrasted with the double chain of the "Gorton" motor-lorry, made by Messrs. Beyer, Peacock, and Co. This firm have given particular attention to the chain question, and have adopted the roller type and automatic pitch of gear with semi-circular teeth. Several working parts of the waggon are exhibited, which offer every guarantee of satisfactory and reliable performance.

The only 6-ton steam-waggon that is on show is called the "Sentinel," and is made by Messrs. Alley and M'Lellan. With a trailer it will carry a load of 10 tons. It is a carefully designed and strongly made vehicle; simplicity and practicability being especially aimed at. The boiler is very easily cleaned, and it has a swinging fire-grate, so as to facilitate clearing away the clinker. In summer, with a load of 6 tons, the fuel consumption of gas coke would be about 12 lbs. per vehicle-mile; while in winter, with a load of 10 tons, it would be about 28 lbs. A side-tipping body may also be had at an extra cost of £50; and in some cases discharging from the side may be preferable to the more usual end-tipping, as, for instance, where there is a trailer attached. The waggon shown by Messrs. William Allchin, Limited, of Northampton, is driven by a double crank compound engine, which can be used as a double engine in case of emergency. The transmission is effected by double Renold roller-chains, which are enclosed in dust-proof cases. An interesting feature of Messrs. James Robertson and Son's (Fleetwood, Lancs.) waggon is that it is provided with a hydraulic tipping-body. This is actuated entirely from the driver's seat; and by the steam-pump and hydraulic ram the body can be fully tipped in one minute. The water used for this operation is returned to the water-tank. Another feature of this machine is that its rear axle is made up of a combination of steel girder and forged ends. At last year's show, this was awarded a certificate of merit. The vehicles of Mann's Patent Steam Cart and Waggon Company, Limited, of Hunslet, Leeds, are well known, and two of them are on exhibition. The machine is completely independent of the platform; the boiler is of the locomotive type; and the transmission is by gearing. Messrs. D. Stewart and Co. (1902), Limited, of London Road, Glasgow, are licensees of the "Thornycroft" gear drive, and have adapted it to their 5-ton lorry. Their locomotive boiler is fed through the crown, and has a dropping fire-grate, thus obviating having any opening in the lower part of the fire-box.

Another familiar steam-waggon is that of the Maidstone firm of Messrs. Jesse Ellis and Co., Limited. They exhibit a combined tip-waggon and street-watering vehicle; but the latter is, of course, easily detachable from the waggon proper. The tipping in this case is effected by steam and gearing, which is operated by the driver where he sits. The driving axle has roller bearings, and there is a spring bar attachment to keep the frame level. Gas coke is the fuel used; and we were informed that one of these waggons had travelled 40,000 miles in the last five years; so that there should be some reliable figures obtainable as to cost of wear and tear. Messrs. Savage Bros., Limited, of King's Lynn, show two 5-ton steam-waggons, one direct coupled to an electric plant, which looks very formidable. At Stand No. 195, Messrs. Bretherton and Bryan introduce their design of 5-ton waggon, with top-fired locomotive boiler, having a heating surface of 75 square feet, and a grate area of 3 square feet. The low-pressure cylinder is 7¾ inches diameter, and the high-pressure one 5 inches; the stroke being 9 inches. The wheels are of cast steel, and the fuel bunkers hold 3 cwt. The engine of the steam motor-lorry of Messrs. Richard Garrett and Sons, Limited (Leiston, Suffolk), always runs in one direction, so that its valve gear is of very simple form. Its differential gear is of spur pinion type, without any bevel wheels. There are double driving chains and double independent brakes. With mention of the steam tractor and waggon of Messrs. Wallis and Steevens, Limited (Basingstoke), we have named all varieties of steam-waggons in the Minor Hall.

There are three firms whose stands are in the Main Hall who have a reputation for steam motor-waggons. The Lancashire Steam-Motor Company, Limited, show one of their Leyland vehicles; being a 5-ton tip-waggon, fitted with composite wheels and telescopic tipping gear, which is worked by hand. The compound engine gives 35 effective horse power under normal conditions. Stampings are generally used; and the vertical water-tube boiler is centrally fed with coke. The Thames Engineering Works, Greenwich, show one of their lorries capable of handling 6 tons; its boiler being of the locomotive type, fed at the side. The transmission is by gearing. A simple and substantial-looking waggon is that of the St. Pancras Iron-Works Company, Limited, London. It is of the standard 5-ton size, and capable of hauling a 3-ton trailer. The engine is of a straightforward pattern, with little to get out of order. The vertical boiler has special return tubes, which themselves form the boiler-stays. Great accessibility is a distinguishing feature of the boiler, the fire of which is on a rocking grate in an enclosed ashpan. The driving chains are unusually large, and provide a wide margin for safety. The fore-carriage of the waggon is arranged like a bogie, so that it has an independent adaptability of its own. A recent test run of 38 miles on a St. Pancras waggon, before the boiler and steam-pipes were lagged, gave the following average consumption: Water, 9 gallons per mile; coke, 17 lbs. per mile, or 3 lbs. per ton-mile. The average speed was 5¼ miles per hour.

It will be seen from what has already been said that there is quite enough variety in principles and designs in steam motor-waggons to satisfy any intending purchaser. He can weigh up the essentials of a boiler, and choose between the water-tube, fire-tube, vertical, or horizontal types. In engines, he has the choice between simple and compound, and high or low speed. As regards transmission, he can adopt single chain, double chains, or no chain. So, too, as to tipping arrangements, there are those worked by hand with a single screw, or those with twin screws, by steam, or by hydraulic power. In short, the gas engineer desirous of effecting economies in the matter of his horse haulage, whether for coal or coke services, has every opportunity now to obtain the most suitable make and manufacture.

VERTICAL RETORTS FOR THE PRODUCTION OF ILLUMINATING GAS.

By William Young, of Peebles.

[Third Article.]

About the same time as the alterations last described upon the structure of the original Young and Beilby or Pentland form of retort were being made at other works, I was called upon by Mr. John Fyfe, the Managing Director of Young's Paraffin Light Company to advise as to the reconstruction of the Young and Beilby retorts at their works, which had been in operation for many years and were then getting worn out.

For various reasons, it was desirable that, if possible, the reconstructed retorts should be erected on the old site, and, as a matter of economy, upon the foundations of the original benches. The benches consisted of ten ovens of eight retorts—in all 145 ft. 10 in. long by 13 ft. 7 in. wide, and 30 feet high from the ground line.

It occurred to me that the tendency of the shale residues to flux and clinker in the retorts might be greatly lessened by considerably increasing the height, or, in other words, the length of the retorts, while practically retaining the same section; also by employing the like high temperatures, but passing a proportionately larger quantity of shale through the retorts. The extra rate at which the residues would travel would, I considered, prevent the fluxing of the shale residues to the walls of the retorts, and the subsequent necessary clinkering; and this would be more particularly the case if the mechanical method of continuously discharging the spent shale were adopted.

An oven of four retorts, of similar cross section but of increased height, provided with different forms of mechanical arrangement for the continuous discharging of the shale residues was erected at their Addiewell works to test the matter.

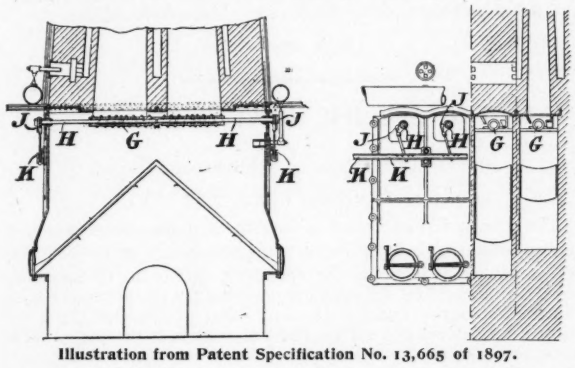


Illustration from Patent Specification No. 13,665 of 1897.

The results from these experimental retorts proved so satisfactory that a full bench of ten ovens was erected at the Company's Hopetoun works, 50 feet high instead of 30 feet as before, but of similar horizontal section. These retorts were provided with a discharging device, consisting of a worm or screw as shown in the illustration, which is taken from the specification of Patent No. 13,665 of 1897.

[Extract from Patent Specification No. 13,665, of 1897.]

The lower end of each retort is provided with a mechanical device for the continuous discharge of the spent shale. A convenient mechanical device for use when the shale ash is soft and free from grit consists of a worm or screw placed upon a shaft carried through the front plate of the chamber, and rotated by any suitable gearing. The worm or screw is one half right-handed, and the other half left-handed; the junction of the screws taking place in the centre of the rectangular retort, and the pitch of the worm or screw increasing towards the ends, so as to cause the spent shale to be more rapidly discharged at the back and front, where the heating surface of the retort is larger in proportion to the mass of contained shale. The screw or worm has no sole plate or base, but is placed between two side plates on the bottom of the retort. The spent shale is either carried by the screw through the space between those plates and the central shaft, or discharged by being carried to their ends.

In the illustration, worms or screws G are secured upon a shaft H rotated by ratchets and pawls J or other means; the pawl levers being engaged between studs on the reciprocating bar K. The screw fitted under each retort is (as mentioned above) formed one half with a right-hand thread and the other half with a left-hand thread—each starting from the mid length of the screw; and the pitch of each portion gradually increases from the centre towards the ends, so as to effect the discharge of the spent shale more rapidly towards the back and front or sides of the retorts where the shale is more rapidly heated and spent. Each screw G is placed between two longitudinal side plates, between the edges of which and the centre shaft the spent shale is discharged or is carried to their ends by the action of the screws.

The original bench of eighty Young and Beilby retorts put through about 120 tons of shale in 24 hours. This improved and reconstructed bench put through fully double the weight of shale, or from 240 tons to 250 tons in twenty-four hours, and gave an equally good, if not a slightly better, yield of crude oil and ammonia; while the difficulty experienced from the fluxing and clinkering of the residues was considerably decreased. The smaller area of the outside walls enclosing the retorts, in proportion to the increased throughput of shale, ensured less loss of heat to the air and by radiation, &c. Instead of requiring from 3 lbs. to 6 lbs. of coal per 100 lbs. of shale (dependent upon the class of shale and the weather) to keep up the heats, as was the case with the original retorts, no coal whatever was needed after the bench was once heated up, which was primarily done by gas from small coal-gas producers placed in the base of the division walls between the ovens. The gas from the shale and residues was amply sufficient for this purpose—in fact, there was a small surplus in fine weather.

A second bench of these mechanically worked retorts was erected at the Uphall works, which also gave good results. The saving in labour by the use of the mechanical discharging arrangements was not, however, quite so great as was anticipated; while the cost of erection was in consequence very much increased. Besides this, on account of the shale residues discharged by the screw into the lower receiving chambers not being so readily seen by the workman as when discharged by manual labour, they were liable to be removed from the retorts before they were completely exhausted, or not so perfectly as was desirable. And further, in consequence of the greater throughput of shale, the temperature of the heat upon the upper iron section of the retorts had to be kept somewhat higher—resulting in the combustion products passing away into the outlet-flue at a higher temperature.

It occurred to the writer that these difficulties and losses might be avoided by abolishing the mechanical discharging screws and converting the large residue receiving chamber at the bottom of the retorts into combustion chambers in which any carbon in the red-hot shale residues could be burned in a carefully adjusted mixture of steam and air, as in the Mond producing process—retaining the inclined bottom to the producer, but reducing the angle of inclination, so that the shale residues would just rest upon them, but would be discharged with the minimum of manual labour. Then, to further utilize the heat in the products of combustion, I arranged to cause them, on their way from the retorts to the outlet flue, to pass up and around the hoppers containing the newly-charged cold shale, dividing up the multiple hoppers so as to provide a larger heat-absorbing surface.

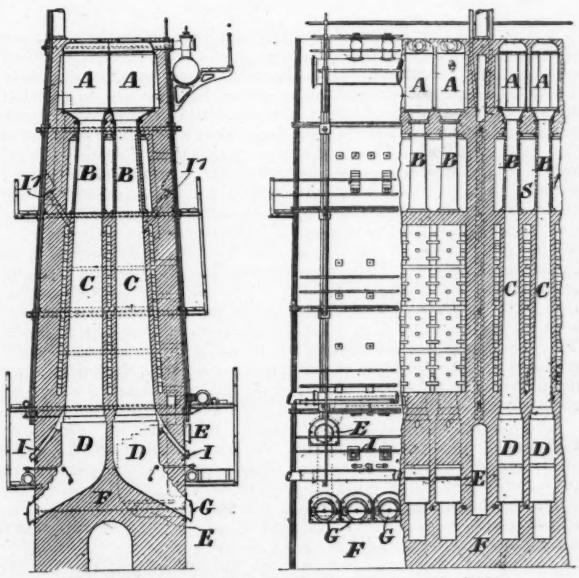


Illustration from Patent Specification No. 15,238 of 1899.

The experimental oven of four retorts at Addiewell was altered accordingly to test the matter; and, on the results proving as anticipated, a bench of ten ovens of eight retorts each—as shown in the drawings and described in the specification of patent No. 15,238 of 1899—was erected at the Hopetoun works.

[Extract from Patent Specification No. 15,238 of 1899.]

The illustration shows (in vertical section and in sectional side elevation) a bench of retorts divided into ovens of eight retorts. Each of the retorts is composed of four sections—a hopper redistillation chamber A at the top, a metallic section B, a fire-brick chamber C, and a combustion chamber D

at the bottom. The fire-brick section and the metallic section are heated externally by combustible gas admitted to the usual arrangement of flues S, and in starting (or when the temperature is below the normal) by means of hot gases from small producers E, which are formed at intervals in the division wall of the brickwork base F of the bench of retorts. These fire gases, after being applied to the retorts, pass up by suitable flues to flue spaces around the hoppers A and serve also to supply external heat to the hopper walls. The shale is fed into the hoppers at the top in the usual way; passes thence in succession down the metallic and brickwork sections B and C; and, after being subjected to the usual distillation, as in the Young and Beilby system, reaches the combustion chambers D, wherein the carbon remaining in the residue is consumed—the ash and spent shale being drawn off through doorways G at the lower ends of the chambers.

Each combustion chamber is made of large capacity; and in it the carbon that may be left in the shale residue as it leaves the retort is burned by means of a carefully adjusted mixture of steam and air introduced into the bottom of the chamber. This chamber is not externally heated by fire but receives the spent shale from the retort in a red-hot condition. The further supply of heat in the combustion chamber is, therefore, wholly due to the burning of the carbon by the introduced air and steam; and all danger of the fluxing and fixing of the shale residue to the walls of the combustion chamber is avoided. To enable the shale residue to be discharged with the minimum of labour, the bottoms of these combustion chambers, instead of being of a curved form, are each constructed with an inclined bottom at such an angle that, while not sufficiently steep as to cause the shale residue to slip or fall out by gravitation alone, will yet require very little manual labour to cause it to do so. To prevent the shale coming down the front more rapidly than down the back, there is fixed in the front of the combustion chamber a shelf or perforated grating inclining backwards at an angle corresponding to that of the opposite side or back, so as to throw the shale residue well back upon the inclined bottom of the combustion chamber, so that when shale is withdrawn it comes down equally all over the retort.

The combustion of the last portion of the carbon left in the shale residue in the large combustion chamber or at the bottom of the retorts, by means of the mixture of steam and air, enables the full yield of ammonia to be obtained without employing such a high temperature to the walls of the retort, and thereby fluxing is prevented. And as the quantities of steam and air admitted to the bottom of the combustion chamber are necessarily limited, any further quantity of steam needful for the proper treatment of the shale is admitted into the bottom of the retort proper by pipes immediately over the combustion chamber D; and this steam still further reduces the danger of fluxing. But in case that, from any cause, fluxing should take place, the retorts are provided with sloping tubes or poker holes I I^1, extending through the walls, by which ready access to the inside of all parts of the retort where the residue is likely to flux can be got by means of iron rods to clear away obstructions.

It will be seen that these retorts very much resemble the structure of the Pentland form of original Young and Beilby retorts, modified as just briefly described. It is, therefore, unnecessary to go more fully into the patent specification. It will be sufficient to say that it was found that air could be used along with the steam at the rate of 2000 to 4000 cubic feet per ton, dependent upon the character of the shale distilled. The necessary quantity was readily ascertained by the appearance of the exhausted residues as they were withdrawn from the combustion chambers. The requisite volume of air (measured or regulated by the governor device, on its way to the retorts) was made to come into intimate contact with the boiling hot exhausted ammonia water as it continually flowed from the ammonia stills. This was discharged into a chamber containing a series of shelves, over which it flowed in the opposite direction to the current of air. The air was thus heated and saturated with steam equal to 8 or 10 gallons of water per ton of shale. The air thus saturated with steam was, together with other waste steam from the sulphate of ammonia saturators, driven forward by a powerful steam-jet into the combustion chambers and up through the retorts.

The burning of the residual carbon in the shale residues by the mixture of air and steam and the production of heating gases and ammonia in the solid walled combustion chambers (as in the Mond process), almost entirely overcame the difficulty experienced from the clinkering of the shale residues in the retorts, as the internal heat so generated rendered it unnecessary to apply such a high heat to the outside of the brick retorts.

The use of air in conjunction with the steam had the further advantage that it reduced the quantity of steam necessary to pass through the retorts by from 20 to 30 gallons of water per ton of shale.

The application of the unexhausted products of combustion to the enlarged surface of the hoppers containing the cold, newly-charged shale was a further considerable gain, in that the shale was thereby heated, and the heat in the combustion products was more fully utilized.

No difficulty whatever was experienced in regulating the heats, as desired, in the various sections of these very long retorts. The whole of the gas required to heat all the sections was introduced into the lowest of the four flues in the fire-brick section, together with as much air as burned the necessary portion of the gas to keep up the desired temperature in that flue; and such further supplies of air were admitted into the successive flues (also into the upper chambers) as were found requisite to burn the remainder of the gas to maintain the temperature desired.

The method of discharging the exhausted shale residues involved a small extra cost in labour over that required in the case of the retorts in which the residues were discharged by mechanical power; but the much smaller first cost of construction, and less expensive upkeep, as also the better facilities afforded for observing that the shale residues were completely exhausted when discharged, were advantages that more than compensated for the slight additional cost for labour. Besides, the extra heat produced by the burning of the portion of the carbon in the residues by the air mixed with steam inside the combustion chambers, and the greater preliminary heating of the newly charged cold shale in the hopper, so accelerated the operations within the retorts that the bench of eighty retorts was able to put through from 15 to 20 per cent. more shale, or from 280 to 300 tons per twenty-four hours—thus further reducing the loss of heat through the outside walls, and by the more perfectly exhausting the combustible products of the heat before escaping into the air.

The more perfect gasification of the carbon in the residues also resulted in the production of more heating water gas; and though these were diluted and increased in volume by the residual nitrogen from the air used—involving extra scrubbing plant for the perfect removal and recovery of the ammonia and naphtha vapours from the gas—yet the gross heating volume of the gases from the shale was much greater, and these were not only equal to heating the retorts, but to leave a large surplus for raising steam, &c. Altogether the results were so favourable that other four benches of the same class of retorts were thereafter erected—one at Uphall works and three at the Addiewell Works of the Company—all of which continued to give excellent results. At a later date a smaller bench of the same class of retorts was erected at the works of La Société Lyonnaise des Schistes Bitumineux, Autun, France, to distil and treat a shale containing a much larger percentage of fixed carbon than the Scottish shale; and it has yielded equally, if not more, favourable results.

(To be continued.)

THE SPECIFIC HEAT OF GASES.

By Dr. H. B. Harrop, of Milwaukee (Wis.).

(Concluded from p. 798.)

The preconvictions based on hypothetical grounds that modify our experimental results, merit some attention; for these fortify us in, or deter us from, interpolating so far as to formulate functions extending unbroken from ordinary temperatures up to flame temperatures with no experimental data except those that have been determined for the two extremities of the curve. The specific heats of the "permanent" or "non-dissociable" gases (O_2, CO, N_2, H_2, &c.) are believed to increase slightly with the temperature; but the increase is slight, and has not been definitely settled. Whether the functions for these gases are rectilinear or curvilinear is absolutely unknown. On the assumption that they are rectilinear, we may argue that the specific heats of such dissociable compounds as CO_2 and H_2O would also increase in a rectilinear direction *if they were not dissociable;* but that the heat absorbed in decomposing any one of the compounds progressively increases the apparent specific heat. The apparent specific heat is the total capacity of the gas for heat energy from whatever cause or causes this capacity may arise. On these purely hypothetical grounds, the variable of the second (or higher) power brought into the function by the act of dissociation may be either a *minus* or *plus* quantity—in the former case tending to produce a curvilinear locus that rises rapidly at first and then gradually approaching zero as the decomposition is completed; in the latter case, producing a function that increases slowly at first but diverges continually farther from the rectilinear locus, in which event the descent to values due to simple specific heat must be very rapid when the temperature of complete decomposition is finally reached. It is the existence of unknown possibilities like these that makes generalization from a few experiments at isolated points so dangerous.

Again, certain assumptions have been made the basis for thermodynamic reasoning that may or may not have any value. There are no means yet of knowing whether there is anything in the supposition that all specific heats become *nil* at absolute zero. If this were known to be true, it would dispose of the idea that the specific heat of any of the gases or vapours (even the "permanent" gases) is a rectilinear function. But it would give added weight to another hypothesis—that the extreme curvature is located in the neighbourhood of the critical temperature.

In regard to the absolute zero assumption, Professor Le Chatelier [private communication], for one, disagrees strongly: "Je vous dirai que . . . je n'ai pas une très-grande confiance dans les prévisions dont le point de départ est basé sur des considérations thermodynamiques. Les thermodynamistes ont en effet le grande tort de mêler à des raisonnements absolument rigoureux des hypothèses tout-à-fait arbitraires qui faussent souvent complètement leurs conclusions. En particulier, tout ce qui dérive de la théorie cinétique des gaz est pour moi sans aucune valeur."

But for regions through which we have no experimental data, inferences based on certain known facts in the behaviour of gases, cannot fail to lead us on to speculations. The "gaseous laws" referring to the relation between volume and pressure and temperature are found to be verified experimentally by sufficiently superheated vapours, but to fail as these vapours cool to the neighbourhood of the saturation point. The extreme curvature for the specific heat function of water vapour just above 100° C., which seems to be certain, presents compelling evidence of connection with the corresponding anomalous expansion of water vapour just above the boiling point; and such a connection is not at all impossible.

If, however, there is reason for the belief that the specific heat functions of all gases exhibit a curvature in the neighbourhood of the saturation point, we are faced with evidence to show that specific heat functions are not independent of pressure; for the saturation or boiling temperature is distinctly dependent on pressure in the case of hydrogen or nitrogen, just as well as in the case of water vapour. Independence of pressure has been very generally accepted; but it is by no means proved.

Sir Andrew Nobel has been led to the conclusion that the specific heats of gases are to some extent influenced by pressure, from his experience in connection with explosives. [Seventy-fourth Session of the British Association—see "JOURNAL" for Aug. 30, 1904, p. 610.]

There is room for experimental work that will be of the utmost value. The calorimetric method of Regnault and others, properly applied to low temperatures, would tell us a great deal. Very recently, Holborn and Austin ("Chemisches Centralblat," 1905, p. 713), have produced a formula for CO_2 by the calorimetric method—

$$CO_2 = 0{\cdot}2028 + 0{\cdot}0001384t - 0{\cdot}000000051t^2$$

shown in Chart I (*c*); but as their first range is from 20° C. to 440° C., and as CO_2 boils at − 80° C. under a pressure of one atmosphere, it sheds no light on this point.

Most of the functions for H_2O that we have are extended in a rectilinear, or nearly rectilinear, direction through a value in the neighbourhood of 100° C. down to 0° C.; and yet we know absolutely nothing of the specific heat of water vapour below 100° C. The calorimetric method could be applied to this problem either by working on air carrying water vapour, or on pure water vapour under reduced pressure. I believe that a particularly elegant experimental device might be contrived to utilize this latter principle by evaporating a charge of water from a calorimeter solely by the action of a vacuum pump, and noting the quantity of water vaporized and the amount of heat absorbed. Of course, this would include an accurate redetermination of the heat of vaporization of water.

For the range between ordinary temperatures and flame temperatures, nothing seems to be more appropriate than the method of sound velocities. [A simple description of the mathematics of this method may be found in Maxwell's "Theory of Heat," Chapter 11.] Professor Harold B. Dixon stands alone in the refinements he has developed for utilizing the method of velocities. A paper of his before the "Engineering Section" of the British Association in 1904, described a variety of his work, and an illustrated lecture before the Institution of Gas Engineers of the same year gives, in detail, the operation of photographing explosion waves and recording their velocities.* I have been disappointed in the hope I entertained of correlating Professor Dixon's matured conclusions with the remainder of the data collected, as will be seen from the following extract from a letter under date of Nov. 3, 1905.

> . . . When Sir William Ramsay wrote me last January about your work, I was on the eve (as I thought) of publishing a paper on the specific heat of CO_2 and air up to 400° C. I had an apparatus for measuring the velocity of sound in a heated pipe filled with hydrogen, air, CO_2, &c., and had got concordant results. . . . At last I got such good results that I determined to try the experiment at higher temperatures, and had a big furnace built for heating the pipe up to 1100° C. But . . . this whole summer has been wasted; . . . and I have had to pull the furnace down. I am now trying electric heating, and know some time must elapse before I can determine γ for CO_2 up to 1000°.
>
> My results up to 350° show a fairly regular rise in the specific heat of CO_2, whether we consider that the true velocity of sound can be determined from one pulse, or whether we simply compare the velocities found under the same conditions in CO_2 and in air or hydrogen, and assume that the specific heat of the simple gas remains constant or nearly so.
>
> These sound experiments confirm my earlier work on the specific heat of CO_2 determined by dropping a steel bomb (charged with compressed CO_2) at 400° C. into cool water—a short account of which was given to the British Association.
>
> So far as my present work goes, it confirms the increase of specific heat of CO_2 up to 400°; but I want to get the specific heat at 1000° before I venture to trace a curve. Steam, I have not tackled yet; it is harder to do than CO_2 by the sound method.

If the heat generated by combustion of any gas is known, and the heat capacity of the products is known for the high temperatures reached by flames, it is possible to calculate the maximum theoretical temperature to which the combustion may attain. By converse process, attempts have been made to determine directly the temperatures actually reached, and with these data, and the known heat generated by the combustion, calculate the heat capacity of the products at the temperatures recorded. Two difficulties are encountered. In ordinary flames (simple or bunsen) the combustion is delayed through a series of steps which are extended over a measurable distance in space, and present many points of differing temperature; and the pyrometer body tends to lose heat by radiation, and fails to rise to the actual temperature of the flame. Professor Lewes and others have published data from the application of the ordinary thermocouple to flames; and White and Traver have given results of experiments calculated to thermocouples of zero diameter, intended to correct for radiation loss. (See also "Les Lois du Rayonnement," by Ch.-Ed. Guillaume, "Revue Générale des Sciences," T. XII., pp. 358, 422.) Féry has deduced temperatures of flames by an ingenious use of the reversal of spectrum lines.†

Haber and Richardt have used the known temperatures corresponding to given equilibrium constants in the water-gas reaction $\left(K = \frac{H_2O \times CO}{CO_2 \times H_2}\right)$ in the bunsen flame.‡ All of these afford comparison data for checking specific heat values, and some are extremely interesting.

The following from Professor Le Chatelier [private communication, under date of February, 1905], which I shall translate freely, has a direct bearing:

> The measurement of the temperatures of open flames with a thermocouple is, in my opinion, an erroneous procedure. We know that by using finer and finer thermocouples, we get higher and higher readings; but it is entirely wrong to believe that a couple of infinitesimal diameter would give the temperature of the flame. The temperature recorded is that of equilibrium between the amounts of heat radiated from the couple and absorbed from the hot gases. If we wanted to attempt an extrapolation method of this character, we might vary the velocity of the current of gas, on the principle that the quantity of heat absorbed in a unit of time by the couple increases with the velocity, and at infinite velocity the temperature of the couple ought to be exactly that of the flame. But you know the value of extrapolations towards infinity. I fear that, to determine the temperature of combustion and the specific heat of gases at elevated temperatures, it is necessary to employ quite different methods.
>
> The two methods which appear to me to be the most desirable are the following: First, that which Mallard and I employed in former times, but eliminating all the defects that became evident in the first series of researches—utilizing a *very large spherical* receptacle and a manometer with an extremely small inertia, to minimize the influence of vibrations. Second, to measure the temperature of flames with a thermocouple, by passing the products of combustion through a series of envelopes, the whole to be enclosed in a furnace which can be heated to, and maintained at, exactly the temperature we wish to measure (whether the flame to be examined is burning or not), and then regulating the temperature of the furnace, by slight increments or decrements, until the flame under examination makes no change in the indication of its own thermocouple.

There are defects in all the methods that have been proposed. For the high temperatures, it seems to me the most promising field will be found in determining the temperatures of flames experimentally (gases burning not in the bunsen form, but as the "blast" or "blowpipe" flame) if a trustworthy means of indicating the temperatures can be found. I undertook during the summer of 1904 (in conjunction with P. A. Degener) to examine the combustion of hydrogen and carbon monoxide with atmospheric air premixed, in a series of concentric solid fire-resisting envelopes or jackets (somewhat similarly to the second method mentioned by Professor Le Chatelier, but without the compensating feature implied in the furnace), and even advanced so far as to produce successfully materials from pure aluminum oxide precipitated by chemical means. But the investigation had to be postponed, and has not taken definite shape.

The new curves offered here for water vapour and carbon dioxide represent an effort to incorporate the various experimental data and the deductions arising from other lines of reasoning—giving due weight to each element so far as an opinion can be reached. In Chart I. (*ante*, p. 797.), all of the available matter is arrayed in its diversity of original forms, to allow the reader to draw his own conclusions. The collection is not entirely complete; but every effort has been made to trace all published figures to their original sources, and eliminate inaccuracies. Many of the published functions have been determined by explosion, and given out for gases at constant volume; and the common method employed for converting to constant pressure may give a semblance of error in some cases. It must never be forgotten that, much as the explosion method has been improved in repeated series of experiments, all the inherent errors of the method have not even yet been eliminated.

In spite of the work that remains to be done by some one or several investigators, more is known about the specific heats of CO_2 and H_2O than was known fifty years ago. In this article,

* See "JOURNAL," Vol. LXXXVI., p. 745.

† See "JOURNAL," Vol. LXXXV., p. 215. ‡ *Ibid.*, Vol. LXXXIX., p. 287.

I have called attention to the diversity of the published data, arrayed most of the values and formulæ that are extant to allow of individual judgment, and pointed out some of the promising methods of research. I do not want the impression to go abroad that I think I have said the last word in indicating the new curves for H_2O and CO_2. These curves are perhaps more dependable than any in use; and their graphic expression makes their use easy. Even this is claiming a great deal.

The gas industry really has a deep interest in specific heat data. Chart II. shows the mean specific heat adopted for H_2O above the boiling-point of water; and for CO_2, CO, N_2, and O_2 above the freezing-point. Anyone who will calculate the heat carried off by the gaseous products from 1 lb. of coal, entering the chimney at 1000° Fahr., taking the mean specific heats at 1000° from this chart ($H_2O = 0{\cdot}65$, $CO_2 = 0{\cdot}27$, $N_2 = 0{\cdot}26$, $O_2 = 0{\cdot}23$), will appreciate the vital importance of the subject.

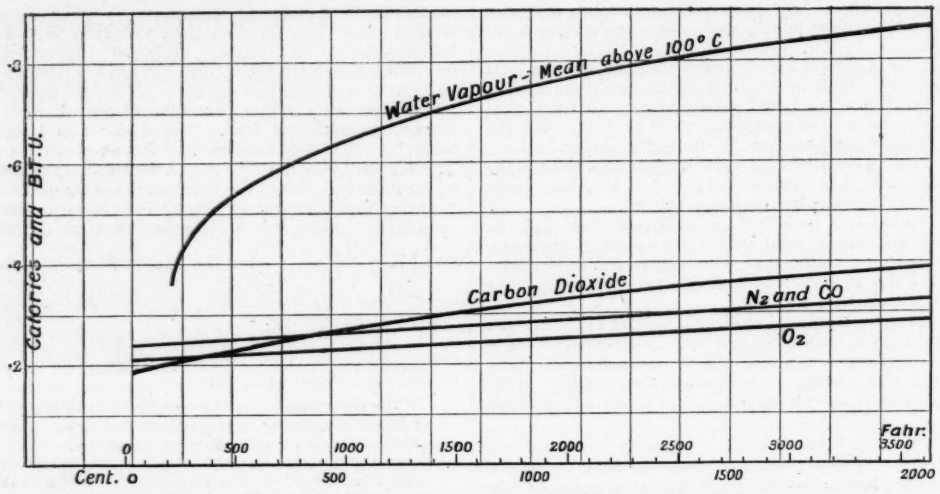


CHART II.—Mean specific heat of H_2O above 100° C., and of CO_2, CO, O_2, and N_2 above 0° C. Permanent gases from Mallard and Le Chatelier formulæ of "Seances, de la Societe de Physique," 1888.

Hydrogen, which cannot be plotted on the above scale, gives the following tabulations:—

Degrees Centigrade	0	100	200	300	400	500	1000	1500	2000
Calories per gramme	3·362	3·423	3·484	3·545	3·606	3·667	3·972	4·277	4·582
Degrees Fahrenheit	32°	212	500	1000	1500	2000	2500	3000	3500
B.T.U. per pound.	3·36	3·42	3·52	3·69	3·86	4·03	4·20	4·37	4·54

THE STRUGGLE FOR SUPREMACY IN THE THORIUM MARKET.

The Position in Germany—Wheels within Wheels.

In the first article published under this heading in the "Journal" for Feb. 27, it was shown, on the information received, that the situation that antagonistic interests had created in America offered one solution of the problem which was agitating many minds as to why the German Thorium Convention had taken such a drastic measure as the reduction of the price of thorium by about half, when on the European surface there was nothing sufficiently momentous to call for such a step. The American situation was a present evil from the point of view of the Thorium Convention; but looking below the European surface, there was also a prospective one—if the symptoms and the facts have been correctly pieced together—which it was to the interest of the Thorium Convention to strangle as near its birth as possible. This evil ("evil" in their eyes) was taking shape at their very doors. And therefore the considerable reduction they made was no doubt intended to effect that very economical operation of killing two birds with one stone, though the stone might be an extremely costly one for them.

When there is a crisis of any kind, to correctly understand it, it is necessary to look into the past, and trace the history of its maturation. This has been done in regard to the American position; and now what has happened in Germany has to be traced. When the great Welsbach business was first organized, there were established in England, Germany, France, Austria, and America, separate companies, each, of course, being under an obligation not to violate the rights and privileges of the others. This, therefore, was the case with the German Welsbach Company, who even to this day purchase their fluid from the Atzgersdorf factory of the Austrian Company. It has therefore never been possible for the German Welsbach Company to do an export trade. The result of this was that an independent mantle-manufacturing element sprang into being, and was constantly developing, in Germany. This section, having no restrictions such as those under which the German Welsbach Company laboured, used the English market (as readers are well aware) to create a not insignificant volume of business; and they used the advantage thus gained to further their direct competition with the German Welsbach Company. It can well be imagined that the Company did not look upon this with particular favour; but, by reason of their bond not to enter into commercial conflict with any other Welsbach Company, they were perfectly helpless. Their business, in consequence, was seriously affected.

Now we must digress a little. The English and the Austrian Companies were at first entirely separate organizations. The history of the English Welsbach Company in this connection, as it is looked into to-day, has a fresh interest. At one time, Baron von Welsbach and his associates were considerable holders in the Austrian Company; and, as the information given in years past at the meetings of the Welsbach Company has shown, they largely dominated its policy. To-day, the English Welsbach Company, through the process of absorption, hold practically the entire capital of the Austrian Company—to, of course, their considerable advantage. Said the Chairman of the Company (Mr. Miles W. Mattinson, K.C.), at the meeting of the shareholders in May last: "The capital of the [Austrian] Company is now £125,000; and on March 31 last, the Welsbach Company held £122,000, or practically the whole of it." As a consequence, the interest that was formerly common between the German and English Companies in a great measure ceased. From this point, it is necessary to rely on the information that has found its way to us.

"The German Company," so it is asserted, "then considered they were in a position to take some steps to enter the English market. Accordingly, two of the strongest factors in the German competition were extinguished by the process of benevolent assimilation. Those interests were Richard Feuer and Schwartz, of Weissensee. These outstanding interests were acquired at what was commonly thought to be extravagant prices; but it was necessary for the German Company to have some such organization in order to carry out their plans. Having acquired these Companies, Messrs. Feuer and Schwartz began to cut prices in the English export trade; the idea being to paralyze the independent mantle-trading element in Germany by taking away their export market. The independent element complained to the Thorium Convention, alleging that the German Welsbach Company were at the bottom of this, and so were violating their agreements with one of the members of the Thorium Convention—the Austrian Welsbach Company.

"The reply of the German Welsbach Company to the allegations was that they had kept their agreements with the Austrian Welsbach Company and the Convention; that the thorium they used consisted entirely of the fluid which they obtained from the Vienna Company; and that they were not manufacturers of thorium, and were not contemplating the manufacture of thorium. When the matter of Feuer and Schwartz was brought to their attention, they asserted that the Feuer and Schwartz interests were entirely separate organizations, that they had no control over them, and that their only interest was that of *stockholders*. It is said in Berlin the Convention considered this a distinction

without a difference, and in any event believed the effects were just the same as they would have been if the German Welsbach Company were actually doing these things.

"Meanwhile, Messrs. Feuer and Schwartz pursued their propaganda with unflagging energy; and it seemed as though they were about to realize their ambition so far as the export trade with England was concerned. This very quickly brought about a period of stagnation in the independent German mantle industry; the result of this being that the independents found themselves unable to carry out their contracts with the Thorium Convention. The inevitable consequence was that they soon accumulated, by reason of their Convention contracts, an excess of thorium which absorbed their capital, and which they could not liquidate quickly enough. This congestion, in turn, forced them to realize the thorium which they held in excess of their requirements at the best price they could get, and practically all of it fell into the hands of Messrs. Feuer and Schwartz.

"This gave Feuer and Schwartz a distinct advantage over all competitors, which advantage was still further used to depress the export trade with England, and made it impossible for the independent trade in Germany to successfully compete. The efforts of these gentlemen in the pursuit of raw material were unceasing; and it is asserted, on good authority, that they were successful in obtaining from the French Syndicate some 200 tons of monazite sand, for which it is said they paid a very 'fair' price—a price based upon the old price of thorium nitrate. Having acquired this monazite, Messrs. Feuer and Schwartz caused a thorium factory to be built. It is stated that the Thorium Convention were perfectly cognizant of all these transactions; and when they had taken shape—all events being propitious—the Convention calmly made their remarkable surprise reduction. The effect on the aspirations of Messrs. Feuer and Schwartz can be as well imagined as explained.

"It now seems that the German Welsbach Company, and its affiliated organizations have, under existing conditions, no advantage whatever over the independent German mantle industry; but that, on the contrary, they have, in a measure, handicapped themselves by purchasing the competing organizations named at a price which was only justified by conditions formerly existing, but which conditions have, through recent events, been almost, if not completely, eliminated."

That is the interesting and almost romantic story that has reached us of what has been happening in Germany in connection with the thorium and mantle industries. As a result of their deeply-laid scheme (which it must be admitted was both neatly formulated and carried out), the Convention and the Syndicate have now certainly the upper hand; and it cannot be seen how the German Welsbach Company—assuming there is no flaw in the construction of the story as related above—can escape from the entanglement without injury. The deduction to be drawn from all that has been stated is that, if the German Convention hold out long enough, they will continue in, as they are to-day, a stronger position than ever.

Regarding the future in respect of the price of thorium. We have explained in a previous article how the Brazilian sources of the sand are located. The source against which the Convention has to contend is in the interior. That is the French concession. It has already, too, been stated that this is a much more expensive sand to work than the Gordon and De Freytas sand which is quite on the sea-shore. There are, for instance, transport and other conditions not attaching to the littoral sources which have to be surmounted, and these add to the cost. On the other hand, the Brazilian Government draw a revenue from the Gordon and the De Freytas sand. But it is said that the Government get no revenue from this interior sand; the consequence being that should this sand play any great part in the future, it would necessarily restrict the Gordon production, and thereby decrease the revenues of the Brazilian Government. It has not yet been demonstrated that sand exists in any quantity there; but should there be any great development, it is exceedingly probable that it will have to yield to the Brazilian Government a revenue in like manner to the Gordon and De Freytas sands. But in any event being a more expensive product than that of the Gordon and the De Freytas concessions, it is difficult to see how, with thorium nitrate at almost cost, this sand can be very lucrative. It would therefore seem that it is completely within the power of the Convention and the Sand Syndicate, acting in concert, to prevent the profitable exploitation of monazite deposits less favoured than their own. How long, however, they will wish to forego profit themselves in order to prevent someone else earning any, will no doubt depend on events.

A few words more. There is also the future American situation. It appears that the opinion is held in Convention circles that the American organizations are so utterly antagonistic that such a thing as their working in unison is absolutely inconceivable, except under severe stress of circumstances. A further reduction in the price of thorium nitrate has been mooted; but certain conservative authorities take the view that such radical action would inevitably result in the American interests being forced to settle their common differences and present a combined front to the common enemy. Should this occur, it requires little foresight to see, it would mean beyond question that the Convention would be forced out of American territory. Might it not then be within the range of possibility that the incandescent world would see the conditions reversed, and the German market in turn flooded with thorium nitrate? This is really, if we read the signs correctly, the most menacing feature at the present time as regards the stability of the price of thorium. But we should not be among those who would complain of anything that kept at a low level the price of the principal requirement in the manufacture of incandescent mantles—our interests being those of the sellers of gas and the users of mantles.

GROWTH OF PUBLIC LIGHTING EXPENDITURE IN LONDON.

FOLLOWING upon former references to the "Standard" articles on "How and Why the Rates Go up," seven other of the London Boroughs and the City of Westminster have fallen under the criticism of the unsparing investigator. In all cases, electric lighting, and in most of them electricity undertakings, take a prominent place in the general indictment of administrative incapacity. We can only lightly touch on a few of the points; prefacing them with the remark that, in considering the tremendous rise there has been in expenditure on public lighting succeeding the adoption of electricity, it must be remembered that this great increase has arisen almost entirely from the electric lighting of only a comparatively small part of the boroughs, and that the greater part of the streets are still lighted by means of incandescent gas-lights at a moderate cost. Islington furnishes an example of this. At a recent meeting of the Borough Council, it was elicited that, in the previous quarter, 100 miles of streets had been lighted by gas at a cost of £4077; while the lighting of only 20 miles of streets by electricity cost £5245. There is one point that we do not recollect having seen made clear yet, and that is as to whether the figures given for the cost of public lighting include the annual capital charges on installing the electric lamps, which are much greater for electric lighting than for gas lighting, and therefore should be stated to get an exact comparison.

Dealing with the boroughs in alphabetical order, Hackney has to be noticed first. There the cost of public lighting in 1888-9 was £8717. By 1899-1900 it had risen to £10,296; in the next three years, there was a leap to £16,215; but in 1904-5 there was a slight reduction to £15,936. Hackney, it is mentioned, charges itself a very low price for electricity, but makes up for the charge allowance by using an unnecessarily large quantity of current. As the writer wisely remarks, there is not the slightest doubt that had Hackney kept to gas lighting, the ratepayers would have saved money, without having a worse light. Indeed, the light would probably have been better. But the borough, having been saddled with a municipal electric light undertaking, has perforce to make custom for the unnecessary business, including, of course, the cost of replacing gas-lamps by electric standards.

Islington is a bad example of an abnormal growth of expenditure on public lighting. Whereas £12,651 sufficed in 1888-9 to pay the whole of the public lighting charges, £24,127 was required in 1899-1900, £32,170 in 1903-4, and £35,367 in 1904-5—an ever-increasing burden. The explanation given for this reprehensible imprudence is "the Borough Council's electric lighting undertaking, and the desperate endeavours made to show a profit on the work." The Council have recently lightly determined to pursue their recklessness by superseding 714 gas-lamps, lighting 15 miles of streets, by 245 flame arc lamps, at a cost for installation of £21,011, the interest and repayment requirements of which will have to be borne in addition to the annual costs. A meeting of ratepayers has been held at which a strong protest was made against the Council's latest proposed extravagance. Further reference to the change is made in our editorial columns. Kensington has also developed a heavy public lighting account since 1888-9. In that year, the cost was £11,988; in 1899-1900, £13,121; and in 1903-4, £17,976. But it should be stated that in 1904-5 there was a reduction of some £1000. It is remarked that there is not very much to grumble at in regard to the outlay on public lighting in Paddington. In 1888-9, it was £6762, in 1899-1900 it was £8344, and in 1903-4 £10,472; but the following year it had increased to £11,255.

As, however [says our contemporary], in 1904 the Council decided to carry out a scheme for improved lighting at a cost of £7200 for new lamps, and from £3000 to £3500 for maintenance, the cost is likely to be somewhat substantially increased in the future. Even here, however, there is room for a word of commendation. With regard to the scheme, we express no opinion; but it is encouraging to note that the Council inquired whether the work of altering the existing position of gas-lamps and increasing the number of lamps could be better made by contract with a Company—the Gaslight and Coke Company—or by direct labour. It found that by going to the Company £1000 would be saved; and it has accordingly entered into the contract.

Quite naturally in dealing with St. Marylebone electric lighting matters, the towering feature is the portentous capital expenditure incurred by the Council over their undertaking; but up to the time that the figures go, the cost of public lighting has not increased greatly since 1888-9. In that year it was £10,079; and in 1903-4, it was £11,924. But in 1904-5, the cost of public lighting was run up to £16,488, consequent upon further installations of incandescent gas lighting; and in the year now closing the cost will be as high as £21,000. The ambition of the Council has been to have the best lighted streets in the Metropolis; and now

they may well stop. But a scheme of partial electric lighting has been talked about, as the Council have their own electricity undertaking. The ratepayers, in view of the experiences of other boroughs, should insist on the brake being applied. St. Pancras is an example of abominable excess. The cost of public lighting in 1888-9, was £12,475; in 1899-1900, £18,168; and in 1903-4, £21,903.

The ratepayers of St. Pancras will see how they are mulcted if they will compare their own case with that of Lambeth—a not dissimilar borough. Of the two, Lambeth has a considerably greater mileage to light. But there is less of the suburban element in St. Pancras; and the two boroughs should, therefore, roughly correspond. In 1903-4, Lambeth, with no municipal electric undertaking, had its streets lit, and well lit, for £13,573, against the expenditure for lighting purposes in St. Pancras of £21,903. The costliness of municipal electric light will be further seen from the subjoined table, showing in various years the amount spent in St. Pancras for lighting the streets by company gas and by its own electricity respectively.

	1899-1900.	1902-3.	1903-4.	1904-5.
Gas	£7,521 ..	£6,847 ..	£6,771 ..	£4,846
Electricity . . .	6,640 ..	11,183 ..	11,367 ..	10,851

It will be noticed that the sum of these figures is not the same as the total cost given in our previous table; but the above figures include only the cost of current and gas respectively, and not the incidental charges, such as the wages of lamplighters, &c.

Competition, it is also stated, has greatly decreased the profits of the Council's electricity undertaking.

Regarding the public lighting of Westminster, it is correctly observed that it would be unfair to criticize the City Council for the acts of their predecessors in regard to the public lighting. Before the amalgamation of the various vestry controlled areas which now forms the City of Westminster, a few of the Councils had bound themselves to installations of electric lighting; and even in their expiring moments the St. George's Vestry entered into electric lighting of a most expensive character. But the facts are that in 1888-9, the cost of lighting the area was £22,393; in 1899-1900, £30,171; and in 1903-4, £43,895.

In his criticizms of the municipal electricity undertakings, the writer goes far into the bye-ways of their finance—excessive periods for loans, want of depreciation, parliamentary charges allocated to general expenses, and not to the electricity undertaking, or only partially so, deficient assessment for rating purposes, and bogus profits. With reference to depreciation, a report has recently been made, by a firm of accountants, on the finances of Poplar. The accumulated surplus profits there are diminishing; and the accountants point out that there are yet further deductions to be made in respect of an engine and dynamo thrown out of use. They also deplore the fact that no provision is made for renewals and depreciation. It is common for municipalities to sneer at the advocates of depreciation for electricity plant. The Local Government Board Auditor has also just suggested to the Dublin Corporation "the necessity" for a depreciation fund in connection with their electric light undertaking; the Elective Auditors of Bradford have raised the question; and the Leeds Corporation have had it seriously brought to their notice. It is strange that financial experts agree on this matter; but town councillors who are not experts think otherwise—and naturally so, as immediate "profits" are their objective.

NATIONAL PHYSICAL LABORATORY WORK.

The General Board of the National Physical Laboratory recently held their annual meeting at Bushey House, Teddington, under the presidency of Lord Rayleigh, P.R.S., when the Executive Committee presented their report on the work done during the past year. It was accompanied by the report of the Director (Dr. R. T. Glazebrook, F.R.S.), and a statement of the work proposed to be carried out during the current year.

Taking first the report of the Committee, they stated that the various researches planned in the scheme of work for 1905 had all advanced. Investigation into the question of wind pressure had been prevented by unfavourable meteorological conditions; but the inquiry into the resistance of material to alternating stress was nearly ready for publication. In the researches into the subject of steam, some definite conclusions had been reached; and progress had also been made in a number of investigations in the department of physics. In the Thermometric Division, Dr. Harker extended his work on high-temperature furnaces, and during the year published the result of his researches on the specific heat of iron up to 1100° C. The work of testing instruments and apparatus increased, as a whole, during the year; the number being 2441, against 1834 in 1904. In the department of optics, five pentane lamps were tested, compared with eight before; but only 110 incandescent lamps, against 447, and no mantles, as compared with 34. An important inquiry, to which reference was made in our editorial columns on the 20th ult., was carried out, on behalf of the Institution of Gas Engineers, on the relation between the candle powers of the pentane, Hefner, and carcel lamps. With regard to the financial position of the Laboratory, the Committee reported that an amount of £2056 had been received during the year in donations and subscriptions; that the receipts for test and other work were £5957; and that the total revenue was £13,637. The ordinary expenditure came to £13,583; and, in addition, £1230 was laid out on equipment, of which £395 came from donations. The Committee announced the intention of the Government, communicated to the Royal Society in December last, to grant a sum of £5000 for buildings during the year, and the increase of the annual grant by £500. They also referred to the very successful meeting in the House of Commons last August, under the chairmanship of the Right Hon. R. B. Haldane, K.C., which led up to a petition signed by 150 members of the House asking that the grants should be increased; and Lord Rayleigh was able to state that the Chancellor of the Exchequer had recently intimated his intention of making the building grant for the year £10,000, instead of £5000 as originally contemplated. He further mentioned that the Goldsmiths' Company had very generously made a donation of £1000, with the request that it should be devoted to some specific object. The new electro-technical building is approaching completion; and it is hoped it may be opened on June 25, on the occasion of the visit of the foreign guests of the Institution of Electrical Engineers. The Committee conclude—

The question has been raised during the year of the scope of the work of the Laboratory. An impression prevails in some quarters that the Committee are prepared to undertake ordinary routine chemical analyses, and so compete with the work of professional chemists. This impression is a mistaken one. Except for Government work and in some few special cases which come individually before the Committee, chemical analyses are only undertaken when they are required to elucidate some physical or mechanical question under investigation. The Laboratory was founded, in the words of the second conclusion of Lord Rayleigh's Committee, as a public institution for "standardizing and verifying instruments, for testing materials, and for the determination of physical constants." The Committee have no wish to interfere with the work of professional chemists, and do not believe that in their conduct of the Laboratory such interference has taken place.

The report submitted by Dr. Glazebrook contained an account by Mr. Clifford C. Paterson and Mr. H. Rayner of the test work done for the Institution of Gas Engineers, to which reference was made in the report of the Committee. It was as follows:—

Two Hefner and two carcel lamps were compared a large number of times with the Laboratory electric standards. The candle-power values of the latter had been previously found in terms of the standard pentane lamp burning in an atmosphere containing 10 litres of moisture per cubic metre of pure air; and it was thus possible, by comparison with a source of light unaffected by atmospheric conditions, to determine to what extent the humidity and pressure of the air affected the illuminating power of the other flame standards. In the two or three months during which observations were made, humidities did not vary over a sufficiently wide range to enable the correcting factor for the Hefner lamp to be determined with very great accuracy; but results, as far as they went, were in close agreement with those obtained previously by Dr. Liebenthal at the Reichsanstalt. The results of these measurements, as well as of similar experiments carried out in Germany and France, are now in the hands of the International Commission, which expects to publish some definite statement this year relative to the ratios of light standards, based on observations made in the three countries.

Mr. Paterson and his colleague refer to the new building already mentioned, which they say has been designed with a view to accommodating as far as possible all the work, and meeting all demands, which are likely to come in the future. The photometric portion covers an area 100 ft. by 25 ft., and consists of two floors, with the battery room above. The ground floor is divided into two rooms, which will probably be used for life-test work on lamps, and photometry of the more ordinary routine type. Above are a room for accurate standard and experimental work, offices and workshop, and space for testing arc lamps. This latter area measures 52 ft. by 26 ft., and has a well at one end where the full height of the building—viz., 30 feet—can be taken advantage of. It is intended to use this room for the measurement of higher candle powers, and arrangements have been made whereby a photometer track 90 feet long can be used along the whole length of the first floor.

In the statement in regard to the work to be done during the current year, it was mentioned that the subject of the resistance of materials of construction to impact is to be inquired into, and the researches on wind pressure completed. In the Physics Department, it is proposed to still further investigate the relation between light standards used in America, Germany, and England; and with this object in view, a carefully standardized Hefner lamp has been sent by hand from the Reichsanstalt, and a 10-candle pentane lamp to Berlin. The advance made in the Thermometric Division in the construction of high-temperature furnaces should, it is thought, make it possible to begin work on a primary standard of light of the Violle type.

The report contains a list of papers published by the Laboratory, or communicated by members of the staff to scientific societies or institutions, or to the technical papers. It includes the article by Mr. Paterson on "Photometric Tests of Street-Lamps in Teddington," which appeared in the "Journal" for May 2, 1905; the same author's paper on "Some Investigations on the Ten-Candle Harcourt Pentane Lamp," contributed to the proceedings of the British Association in 1904, and noticed in our columns at the time; and the paper on "Explosions of Mixtures of Coal Gas and Air in a Closed Vessel," submitted to the Royal Society last year by Messrs. Bairstow and Alexander.

NON-STATUTORY TO STATUTORY CONDITION.

An Appeal to Newly Incorporated Gas Companies and those Contemplating Incorporation.

An important circular-letter was sent out last week by Mr. F. Paternoster, the Engineer and Secretary of the Felixstowe Gas Company, to newly incorporated gas companies and those seeking incorporation; and it is hoped that this publication of the letter will also bring to the assistance of the cause which has been taken up with such zeal by the Directors of the Felixstowe Gas Company those non-statutory companies who are contemplating, or will be sooner or later, approaching Parliament for incorporation and statutory powers.

The question of the claim of the Inland Revenue Commissioners for conveyance duty, was first raised in these columns very soon after the matter had begun to be agitated privately as between the Commissioners and the Companies upon whom the claim had then fallen. Whatever the legal rights of the Commissioners may be (and that is the issue), there cannot be two opinions as to the iniquity of the claim under such a condition as the mere conversion of a company from the non-statutory to the statutory estate. This is well shown in the words of Mr. C. A. Cripps, K.C. (as given in Mr. Paternoster's circular-letter below): "The new company *only comes into existence when the old company is dissolved;* and there never existed at any time two parties as between whom any contract or conveyance by way of sale would have been possible." As to the rights of the Inland Revenue Commissioners, eminent legal men (as our previous articles and references to the matter have indicated) are in disagreement; but Mr. Cripps (whom the Companies who have so far joined with the Felixstowe Company have consulted) is, as seen above, distinctly of opinion that the Inland Revenue Commissioners have strained the meaning of the Act beyond its intention.

From what Mr. Paternoster says in his letter, however, the Inland Revenue Commissioners have not, on being approached, exhibited any particular willingness to facilitate the stating of a case for the determination of the Courts; but as the advice obtained shows no considerable expense (if several companies act jointly in the matter) would be incurred in the first instance by submitting a case to the Courts, it would be a pity not to advance the matter at all events another stage, now that it has been prosecuted to the present length. Of course, if the Companies succeeded in gaining a favourable decision in the first Court, the Commissioners would certainly not allow the matter to rest there, and an appeal would be bound to follow. Still, if any substantial front can be presented, the Commissioners might after all feel disposed to agree that, there being a real grievance, it was a matter upon which they could give some undertaking in respect of costs, in order to have the legal position once and for all clearly defined. We therefore hope the appeal will receive a good response.

The circular-letter issued by Mr. Paternoster, acting upon the instructions of his Directors, is as follows:—

You are no doubt aware that the Commissioners of Inland Revenue have of late years demanded payment of conveyance duty on the market value of the undertaking—*i.e.*, of the paid-up capital and liabilities of a limited company—when it becomes incorporated by Private Act of Parliament—it being contended by them that incorporation constitutes a conveyance on sale; the Act of Parliament being the transfer deed.

The Board of Inland Revenue, in making their claim, direct attention to the provisions of section 12 of the Finance Act, 1895, by which section it is enacted that by virtue of any Act when any property is vested "by way of sale" in any person, or any person is authorized to purchase property, then within three months of the passing of the Act a King's Printers' Copy shall be produced to the Commissioners of Inland Revenue, duly stamped with the *ad valorem* duty payable upon a conveyance on sale of the property.

The Felixstowe Gaslight Company was incorporated by Act of Parliament in the year 1904. Capital duty was paid upon the whole of the authorized capital, including that already raised by the Limited Company; and on the 26th of May, 1905, a letter was received from the Secretary to the Inland Revenue Commissioners, pointing out that a copy of the Company's Act had not yet been produced, stamped with the *ad valorem* duty due upon a conveyance on sale.

The Directors of the Company did not consider that there was a transfer of the property within the meaning of the Finance Act; and through the medium of a Member of His Majesty's late Government, the views of the Company were placed before the Chairman of the Inland Revenue Commissioners, who, however, could not be induced to accept their view of the matter.

The Secretary to the Gas Companies' Protection Association was then approached; and after several interviews and a great deal of correspondence, the Committee of the Association undertook to take Counsel's opinion. I also wrote a letter, which appeared in the "Journal of Gas Lighting" of May 9, 1905, which brought me a great deal of correspondence and promises of support from other Companies.

Mr. W. O. Danckwerts, K.C., was the Counsel to whom the Committee of the Gas Companies' Protection Association submitted the case; and on June 10, 1905, he stated that: "There is here a transfer of property from the limited company to the newly created company, each company is distinct, and each is a different legal entity, and the new transferee company gives consideration for the transfer—viz., in shares—to the old shareholders and in meeting the liabilities of the old company. It is immaterial that the consideration does not go to the transferors. In my opinion, the Commissioners, if the case were contested, would succeed in getting their views affirmed by the Courts."

The Directors of the Felixstowe, and of several other Companies, did not allow the matter to drop at this point, particularly as it afterwards transpired that Mr. Danckwerts, K.C., is often retained by the Inland Revenue Authorities in cases which they bring before the Courts; and his opinion might therefore perhaps not be considered as an absolutely unprejudiced one.

A meeting of interested companies was held in London on Nov. 20, 1905; and at that meeting it was decided, if sufficient support could be obtained, to have a case stated for the opinion of another Counsel. The necessary assistance being forthcoming, the case was drawn up by Messrs. Batten, Proffitt, and Scott, of 32, Great George Street, Westminster, for Mr. C. A. Cripps, K.C.; and on Dec. 29, 1905, this gentleman gave his opinion, which in brief was as follows: "There is no doubt a vesting of the property in the new company under the Act. But the new company only comes into existence when the old company is dissolved; and there never existed at any time two parties as between whom any contract or conveyance by way of sale would have been possible."

This eminent opinion being entirely opposite to that of Mr. Danckwerts, K.C., the Inland Revenue Authorities were again approached, with a view of inducing them to have a case stated for the decision of the Courts; and as there appeared to be strong grounds for disputing their attitude in the matter, they were asked whether they would agree that all costs should be borne by the State. As this was refused, they were then asked if they would forego their own costs in the event of a decision in favour of the Crown. This request also was refused, although there are precedents for both forms of procedure.

A further meeting of the interested companies was then called for March 7, when it was resolved, if the costs were not prohibitory, and a sufficient number of companies promised their support, to proceed in the following manner:—

1. Request the Inland Revenue Commissioners to state a case for the decision of the first Court.
2. Should a verdict be given in favour of the Crown in this Court, the Companies not to carry the case any further.
3. Should the decision be favourable to the companies, and the Commissioners decide to carry the case to the Court of Appeal, and from thence to the House of Lords, a representation be made to them asking that all costs be borne by the State—precedents being in favour of their consenting to such a course.

My Directors are informed by the Solicitors acting in the matter that we can safely proceed on the basis of a sum of £100 covering the total costs to both parties of having the case argued in the first Court. Thus, even in the event of judgment being given against the companies, should a fair number join together, their individual costs will be very small. I may say it was thought at the last meeting that the cost of such a case should be paid by a contribution from each of the companies in proportion to the amount of their paid-up capital. Consequently, if companies representing a total capital of only £200,000 join together in this matter, the cost to each of them will not exceed 1s. per cent. upon their paid-up capital.

My Directors trust, however, that a much larger amount of capital will be represented; and they strongly urge the advisability of joint action, in order that this difficult question may be settled. They believe the claim of the Inland Revenue Authorities to be an unjust one, and that the Finance Act of 1895 was never intended to apply to such cases.

I shall be glad if you will place this letter before the Directors of your Company; and if they are interested either as a newly-incorporated company or as one entertaining the subject of incorporation, I hope they will, after thoroughly considering the matter, be prepared to support the few companies who have made a stand during the last twelve months.

I should mention, in conclusion, that unless sufficient promises of support are received from the affected companies, further proceedings must necessarily be stopped. It would not, of course, be politic for any small company to individually contest the matter with the Inland Revenue; but this is certainly a case where a united effort, at a small individual cost, may effect a large saving in obtaining Private Acts of Parliament.

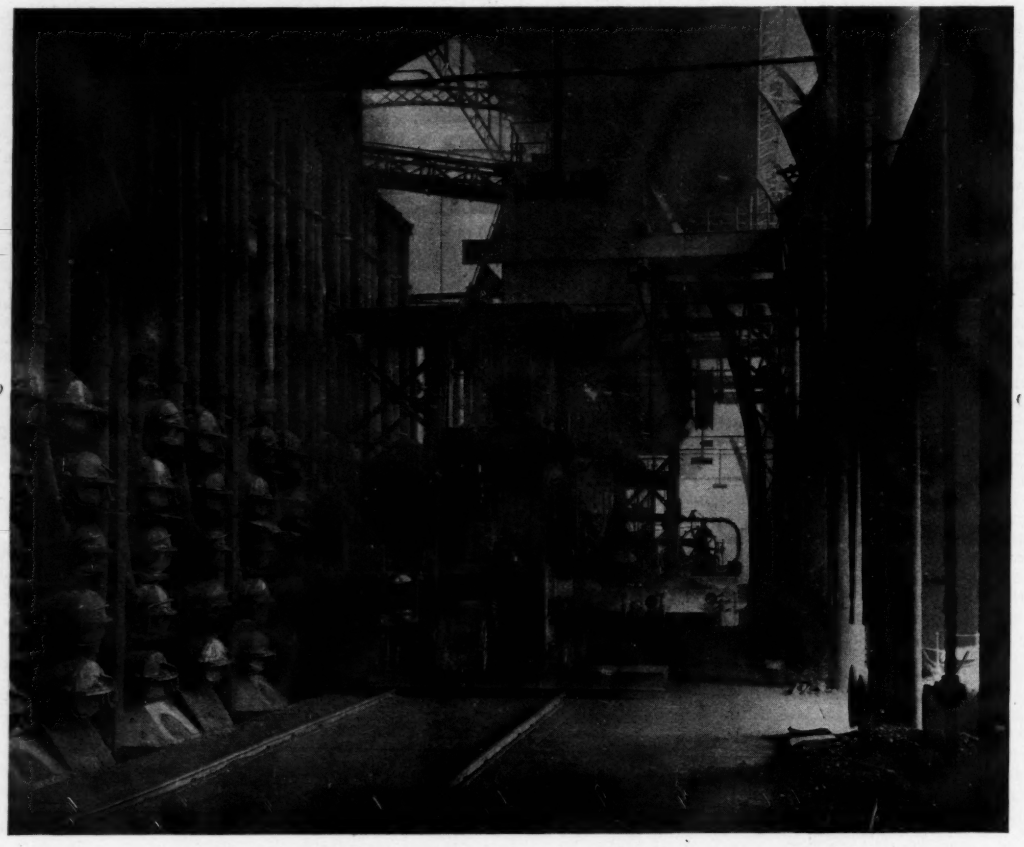
The Bueb Vertical-Retort System.

The annual report of the German Continental Gas Company (some figures, &c., from which will be found elsewhere) states that the process of gas making in settings of vertical retorts according to Dr. Bueb's system was exhibited to a specially convened assembly of technical men at Dessau on Sept. 20. More than nine months' experience of the working of the latest development of this system has proved it to be good in every respect; and the Company have therefore decided to undertake, during the present year, the whole of the gas supply at Dessau by means of vertical retorts, and half that from the Potsdam works, to be followed by the other half in 1907. Meanwhile, the new process has been investigated by a number of representative technical men, with the result that, in the current year, it will be brought into use at large and important gas-works in Germany and other countries, in virtue of agreements made with the Dessau Vertical Settings Company.

The London and Southern District Junior Gas Association will meet next Friday, to hear and discuss a paper by Mr. H. J. Carpenter, of Harrow, entitled "Notes on Carburetted Water Gas." The April meeting of the Association has been reserved for the discussion of queries forwarded to the Question-Box.

STOKING MACHINERY AT BECKTON.

A complete installation of West's stoking machinery has recently been introduced at the Beckton Gas-Works of the Gaslight and Coke Company, which embodies several novel features.



Interior of No. 3 Retort-House at the Beckton Gas-Works.

The stoking machinery shown above has been introduced into No. 3 retort-house, which has been remodelled. This retort-house formerly contained thirty settings of nines in three tiers, or 540 mouthpieces; and these have been replaced by thirty settings of tens in five tiers 22 in. by 16 in. ⊏ in section—equivalent to a total of 600 mouthpieces for the whole house.

Mr. Thomas Goulden, the Chief Engineer, in order to meet the particular conditions of the retort-house, arranged with West's Gas Improvement Company. Limited, to construct a special combined ram discharging and drawing machine. One of these machines is placed on each side of the retort-house bench, so that the retorts can be discharged from either side; and owing to the arrangement of furnaces, which are on both sides of the retort-bench, the drawing machines can be utilized for filling these when occasion necessitates it. Further, in the event of the retorts in course of time getting into such a condition that it is found impossible to satisfactorily discharge the coke with the ram discharger, the drawing machine can then be utilized.

The charging machines are fitted with West's double-scoop charger, which places a large charge of coal in the retorts at one stroke. Both the charging and the combined discharging and drawing machines are actuated by compressed air.

There are four coal breakers and elevators in the retort-house; and each elevator is provided with a conveyor across the retort-stack, so that there are eight points of supply for the charging machines to obtain coal from, and the coal-storage hoppers have a total capacity of 400 tons. Thus all coal wheeling can be dispensed with on two shifts.

The photograph shows the interior of the retort-house. The machinery was put into operation at the latter end of November last, and has been continually working since then in, we are pleased to learn, a very satisfactory manner.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

The members of the Scottish Junior Gas Association—Western District—paid the final visit for the present session on Saturday, when they inspected the pig-iron and bye-products works of the Summerlee Iron Company, Limited, at Coatbridge.

The party numbered about fifty; and they were met on their arrival by Mr. David M. Mowat, the General Manager, and Mr. James Downie, the Works Manager, who conducted them over the establishment.

A special feature of the visit was the inspection of the 1000-horse power patent gas-driven blowing-engine, which was seen at work—a sight which was much appreciated by every one of the members present.

At the close of the proceedings, Mr. James Bell, of Airdrie, the President, thanked Mr. Mowat and Mr. Downie, on behalf of the members, for their kindness in showing them over the works; and the first-named gentleman suitably replied.

The late Mr. John Wilson, the Chairman of the Glenboig Union Fire-Clay Company, Limited, left estate of the gross value of £160,950. The late Dr. Clair J. Grece, one of the Directors of the East Surrey Water Company, and for many years Town Clerk of Reigate, left £39,217.

In the "JOURNAL" a few weeks ago, reference was made to a new electric lamp which was expected by certain people to displace gas as a cheap illuminant. According to the Engineering Supplement to "The Times," it comes from the laboratory of Dr. Kuzel, of Baden, Austria; and its novel feature is merely the use of a metallic filament, without any other variation from the size and design or process of manufacture of glow lamps. To summarize the series of tests carried out in Vienna, it is sufficient at present to record that, with an average consumption of 1 watt per candle power, these lamps are claimed to maintain almost their maximum efficiency for upwards of 3000 hours. If correct, this gives them the life of three ordinary lamps, with a consumption of one-third the amount of energy required for one. It is thought that before being placed on the market for sale, their efficiency will be improved, though possibly at the cost of their length of life.

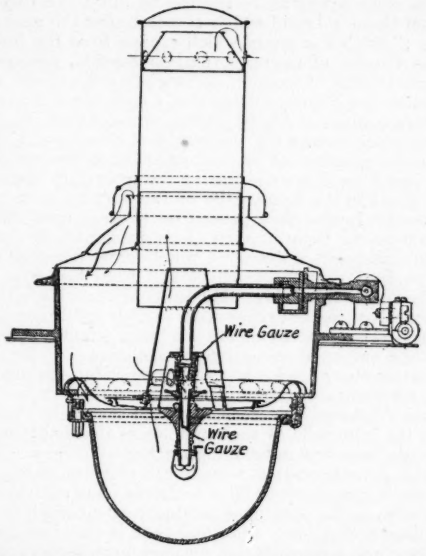
AN INTERESTING PIECE OF ENGINEERING.

A Skew Bridge over a Canal for Connecting Up a Gas-Works Siding.

The accompanying illustration has reference to an interesting piece of engineering which Mr. Vincent Hughes, the Engineer of the Smethwick Gas-Works, has lately had in hand. A railway siding is being constructed in connection with the gas-works; and this has to be carried over a canal on a skew bridge of about 150 feet span. The putting together of the bridge itself (some idea of the dimensions of which will be gathered from the photograph) was completed so that the work of getting it over the canal could be accomplished last Sunday morning; it being anticipated that the latter operation would occupy not more than a few hours. Though Sunday is, of course, a most suitable day for carrying out a job of this character, it is not one which, in this country, is chosen for anything in the nature of a "function." Mr. Hughes will, however, doubtless—and deservedly so, too—be heartily congratulated on the successful completion of the work, when the formal opening ceremony takes place in the course of a month or two.

LIGHTING RAILWAY CARRIAGES BY GAS.

Our readers may remember that, at the last meeting of the Société Technique du Gaz en France, a paper on the subject of lighting railway carriages by compressed gas was read by M. Naudé, one of the engineering staff at the Havre station of the European Gas Company. The arrangement described was the one in use in the coaches of the Western of France Railway Company, who employ inverted incandescent burners. It appears



from a report made by M. Chapsal, the Chief Engineer of the Locomotive Department—an abstract of which was given in a recent number of the "Revue Industrielle"—that the form of lamp adopted, which was illustrated in the "JOURNAL" in connection with M. Naudé's paper, while giving excellent results generally, was found to have certain defects. When working, the burner became very hot; and if the pressure happened to fall, the gas ignited inside the burner on a level with the air-inlets, and eventually the carriage was plunged in darkness. Apart from the inconvenience and danger attending this, damage was done to the burner, which rapidly deteriorated. A trial was made with another having a horizontal injector; but while the heating was obviated, the benefit derived from recuperation was lost to a large extent, and the illuminating power of the gas suffered in consequence. The result has been a reversion to the original form of burner with vertical injector; the heating difficulty being overcome by the use of wire gauze, as shown in the following diagram.

Placed in the positions indicated, the pieces of wire gauze prevent the flame from turning inwards towards the burner. Moreover, between the latter and the mantle-holder there is left a cone-shaped space, which prevents the transmission of heat by conduction, and in which the flow of gas creates a cooling current of air. This lamp can be attended to from either the outside or the inside. The latter method is preferable, as any shaking of the mantle is avoided; but it is only practicable during long stoppages. From the roof of the carriage, on the other hand, the lantern can be cleaned without disturbing the passengers. The mantle is protected by means of nickel wire netting, which has the advantage of catching any fragments in case of breakage.

On the main lines, the lamps are provided with a special pipe furnishing a supply of gas to a pilot light, whereby it is possible to ignite or extinguish the various burners in a carriage either singly in each compartment or simultaneously from the outside. By the use of these lights, considerable economy is effected in the consumption of gas. The coaches carry two gasholders, the capacity of which is calculated on the basis of 4·25 cubic feet of coal gas, compressed to 33 lbs., per lamp; the consumption per hour being 1·4 cubic feet of expanded gas. Supposing that the initial pressure was only 22 lbs., the capacity of the gasholders would be equal to 30 hours' lighting. This is more than sufficient for a journey from Paris to Brest and back, which is the longest run on the Western line. To ensure regularity in delivery and pressure of the gas, a Fournier double governor is employed.

THE SUCTION TYPE OF GAS-PRODUCER.

At the Meeting of the Coventry Engineering Society on the 9th inst., Mr. C. H. TREGLOWN, of Birmingham, read a paper (by permission of the Institution of Mining Engineers) on the above subject. There was a good attendance of members; the matter to be considered having attained some prominence in the city, owing to discussions which have taken place in the Council.

Having explained the construction of a complete suction gas-producer, the author described its starting and action when working in connection with a gas-engine. He claimed that after the generator had been set to work, it was only necessary to inspect it for a few minutes at intervals of two to three hours, in order to supply more fuel, and to rake out any ashes that might have accumulated on the fire-bars. He said the working of the plant could be easily understood by an ordinary labourer; and as only the minimum of attention was required, the expenses were practically *nil*. The advantages of the suction type of gas-producer, as compared with the older form, were many. Of these, the author enumerated the following: No steam-boiler or gasholder required; constant supervision not needed; only a small amount of floor space occupied; no foundation necessary; no risk of gas escaping; apparatus may be fixed indoors; great economy of fuel, as anthracite beans could be used; gas generated only when required by the engine; no gas blown or burnt to waste on light loads.

A number of results obtained in every-day work showed that, with anthracite coal at 20s. per ton, more than 10 brake-horse-power could be obtained with an outlay for fuel of 1d. per hour when working the suction gas-producer. A small installation at a water-works, supplied last year, was tested by an independent engineer, and the duty exceeded 100 million foot-pounds. The author thought that this would be admitted to be extraordinary,

when they knew that the water-horse-power was less than 2. In the case of a larger installation for a water-works on the Continent, a test made within the last few months, with the gas-engine working below its proper load, exceeded 116 million foot-pounds; and after making allowance for partially consumed fuel separated from the ashes, &c., the duty would exceed 125 million foot-pounds. In this case, the water-horse-power was about 14—a remarkable step in the way of economy. During the present year, exhaustive tests had been made with two distinctive types of producer in one installation of pumping machinery. In both cases the brake-horse-power was less than 19; whereas the duty in each instance exceeded 170 million foot-pounds. Mr. Treglown said that, as a matter not of theory or speculation, but of stern fact, the saving in using the suction gas-producer was so great that it would almost invariably pay to instal it, even for sizes below 30 brake-horse-power. It was no more singular than true that this type of gas-producer, working in conjunction with a gas-engine, proved it to be specially applicable in numberless cases, particularly where power was absolutely required in small or large amounts, where steam was inadmissible, not obtainable, or too costly, and where the question of economy was imperative. Suction gas-producers would certainly come into use for marine purposes, and for propelling boats on canals, inland waterways, and lakes where there was no rough water.

In the course of the discussion on the paper, Mr. J. A. Jeckell, the Manager of the electricity works of the Coventry Corporation, inquired whether bituminous coal could be used in the producer. The reply was in the negative; but he was informed that it was occasionally used in a pressure producer plant, with which an elaborate arrangement was necessary in order to get rid of the tar. The same questioner was assured that there had been no complaints from local authorities about the smell arising from blowing off bad gas. As to draining off the water, one or two objections had been raised, because the water contained small particles of gas held in suspension, which passed into the drains. This Mr. Treglown said could be prevented by trapping the drain leading from the plant into the main drain. When a new form of apparatus was used, it was not necessary to pass the water into the drains at all, as it could be used over and over again if there was any objection. In reply to a question, Mr. J. W. Roebuck was informed that the suction system was successful with an intermittent load on the engine.

A hearty vote of thanks was accorded to the author and his assistant (Mr. Robson).

FIRE, FIRE RISKS, AND FIRE PREVENTION.

As already notified in the "JOURNAL," a course of four Cantor Lectures on the above subject is being delivered at the Society of Arts on Monday evenings by Professor VIVIAN B. LEWES, F.I.C., F.C.S., the Chief Gas Examiner to the Corporation of London. The second of the series—in which the lecturer dealt with the dangers attending the use of artificial illuminants— is the one with which our readers are more particularly concerned; but the first contained much interesting matter. We select a few noteworthy points from the two lectures; and hope to notice the concluding two on a future occasion.

Opening with a few remarks on the indestructibility of matter, the lecturer pointed out that though a candle may disappear *quâ* candle in performing its function as a light-giver, its constituents are not really lost, but have only assumed new and gaseous forms. Comforting, however, as is the knowledge that, in the abstract, matter is indestructible, it affords but poor solace to the unfortunate householder whose worldly belongings have been destroyed by fire, and who sees the collected treasures of a lifetime being wafted heavenward in a cloud of smoke, steam, and carbon dioxide. Fire losses are absolute losses; for the products of combustion are of use only to Nature; and though the owner of the consumed property may be fully insured, the loss is merely distributed among the community. As the annual monetary loss in the British Isles alone has been placed at £70,000,000 per annum, the lecturer thought the matters on which he was about to address the audience deserved all possible attention.

Professor Lewes then glanced at the existing English literature on the subject, and referred first to the researches of the "Prince of Philosophers" Antoine Laurent Lavoisier, who was born in 1743, when chemical science could scarcely be said to exist, devoted his life to researches on combustion, and gave us the first true explanation of the cause and nature of fire. Lavoisier made the great discovery that air is necessary to combustion, and he was able, as the result of his investigations, to attack and overthrow the phlogastic theory of Stahl, which had ruled supreme during the early years of the century, and which attributed combustion to the escape of something pre-existing in the material. It was the discovery of oxygen by Priestley, in 1774, that in reality placed in the hands of Lavoisier the means of completing his researches. He came to the conclusion that combustion was in truth the evolution of energy during the rapid rushing together into combination of the combustible body and the oxygen of the air. Here was to be found the key to all the actions spoken of under the general term of "fire;" and further experiment showed that, in order to start this rapid combination between the substances oxidized and the oxygen of the air, it was only necessary to heat the combining bodies to a temperature known as their ignition-point. Though the ignition-point of any substance was a fixed and unalterable temperature, the size of the mass to be ignited played a very important part, as the smaller it was, the more easy was it to raise it to ignition. Though the ignition-point marks the temperature at which ordinary combustion gives rise to the phenomena of light and heat, the same chemical action may be proceeding at lower temperatures, but at so slow a rate that the energy developed is able to spread itself to the surrounding objects, and so escape notice. Professor Lewes cited examples in illustration of this, and explained that the action which takes place below the ignition-point is chemically identical with that which goes on during rapid combustion, and only differs from it by being spread over a longer interval of time. It was therefore called "slow combustion." He went on to say that substances which are capable of entering into this condition constitute serious fire risks, as it is only necessary for them to be collected in sufficient quantity to enable surrounding material to keep in the heat, for the temperature in one part of the mass to rapidly increase; and inasmuch as the rise in temperature further hastens the chemical action, the heating gradually becomes more rapid, until the ignition-point of the whole is reached, and the entire mass thereupon bursts into active combustion.

The lecturer next directed attention to the ordinary phenomena of combustion, which consist of incandescence, flame, and smoke; and he reminded his audience that their prime cause is the rapid evolution of energy developed during the combination of the combustible with the oxygen of the air. Of the three gaseous products of combustion, steam alone plays an important part in the formation of smoke; while the other important constituents are tar vapour, minute particles of unburnt carbon, and ash, drawn upwards by the draught created by the fire. The popular idea was that smoke consists mainly, if not entirely, of particles of carbon rendered slightly adhesive by tarry matters—that it is, in fact, like the soot we find deposited in chimneys. Microscopic examination, however, revealed a far more interesting condition of things. Smoke did not, said Professor Lewes, contain any particles of free carbon, but appeared to consist of an immense number of small round particles in the wildest condition of commotion and movement, each rushing about and never coming in contact with its neighbour. Whether this cloud of floating vesicles was derived from a cigarette, a coal fire, the crude gas leaving the gas-maker's retort, or from one of the huge conflagrations with which our Fire Brigade has to deal, if we collect them in such a way as by friction to burst the tiny vessels, we get from them a liquid which comes under the generic heading of "tar;" while the gases which escape from the interior of the vesicles consist of nitrogen, carbon dioxide, carbon monoxide, hydrogen, traces of oxygen, and such hydrocarbons as methane. The smoke from the combustion of a coal-fire or the conflagration of a store containing textile fabrics or much resinous wood, forms a heavy black cloud; the deepening of density and colour being due to the presence of minute particles of unconsumed carbon which had been deposited during the secondary chemical actions taking place in the flame given by the burning material.

Professor Lewes then passed on to deal with the subject of smoke from the point of view of its danger to life during conflagrations, and said it deserved much more attention than it had ever received, as far more lives had been lost from suffocation than from actual burning. He directed attention to the difference in the smell of smoke arising from various substances, and pointed out that when present in not too large quantities, the nose can detect the nature of the source of the smoke. The construction of a satisfactory smoke and dust respirator for use by firemen under conditions where the smoke is so thick as to seriously impede their labours was, he said, by no means an easy problem; and of the hundreds of such appliances that had been suggested and made, very few indeed approached efficiency. During early stages of a conflagration, when there is more smoke than fire, a good smoke respirator or filter of simple construction would afford much help, as the poisonous products of incomplete combustion were absent; but when a fire had been in progress for some time, and there was a considerable mass of incandescent carbonaceous matter at the seat of the mischief, a large proportion of carbon monoxide—the product of incomplete combustion—began to make its appearance. This introduced a new and serious source of danger to the workers, owing to the intensely poisonous nature of the gas. The increase in its quantity with enlargement in the mass of burning material, was due to several factors. In the first place, the gas was produced when the mass of incandescent matter was large; so that the quantity of air was insufficient to complete the combustion. In the next place, the proportion of carbon monoxide to carbon dioxide increased with great rapidity with rise of temperature. Finally, the playing of water on to the incandescent carbonaceous mass, and the action of the steam generated on the glowing carbon, yielded carbon monoxide. This gas had a distinct toxic action when present in even small traces in the air inhaled; 0·1 per cent. producing, after half-an-hour's breathing of the atmosphere containing it, inability to walk, while 1 per cent. would produce unconsciousness in a couple of minutes, followed by death if the "gassed" person were not promptly removed into an uncontaminated atmosphere. Having referred to the various attempts made to produce appliances to allow smoke-laden air to be inhaled for some time without injury, Professor Lewes said perhaps the one most used was a survival of the old

air-tubes, and was known as König's respirator. It was a form of smoke helmet which was very popular with firemen. For large conflagrations, the Vajin-Bader helmet, which allowed more independence of action than the König respirator, was well adapted. Another excellent appliance was the Chapin-Sherman cap, which permitted of a much larger supply of air being carried than by the Vajin-Bader helmet.

The lecturer concluded by saying that, when studying the causes of fire, it soon became apparent that they are by no means limited to cases in which combustion is caused by the direct application of flame or some other source of heat; many secondary actions tending to bring a mass of material accidentally to its point of ignition. On taking the causes of fire as revealed by the statistics of any large town, one generally found that, in one way or another, matches were the most prolific cause; while defective vents and flues or fireplaces also, owing to the overheating of beams and woodwork near them, reached a very high total. Taking the returns for 1904 in London, Liverpool, Manchester, Glasgow, Leeds, and Sheffield, the chief ascertained causes of fire were: Matches, 1695; overheating from defective flues and fireplaces, 853; gas, 464; oil, 408; and candles, 327. A myriad of other causes made up the remainder.

The second lecture, delivered on the 19th inst., was devoted mainly to a consideration of the chief cause of fire given in the preceding paragraph—viz., matches. The match, said Professor Lewes, had now become so much a part of our civilization and life, that we failed to recognize what it really meant to us, and what life would be without it. If we went back only a hundred years, we found ourselves in the flint and steel age; but in 1827, John Walker, of Stockton-on-Tees, invented the first English friction matches, to which the name of "Lucifers" or "Congreves" was given. They did not contain any phosphorus; but they proved the forerunner of the phosphorus match, the method of producing which useful, but somewhat dangerous, article the lecturer fully explained. The number of accidents arising from matches attracted attention; and in 1855 safety matches were produced by Lundstrom, in Sweden. There were nevertheless serious fire risks due to matches; and they might be grouped under five heads: (1) Dangers in manufacture; (2) dangers during storage and carriage; (3) the flying off of an ignited head, or the breaking off of the unignited head during the striking; (4) the use of matches as playthings by children; and (5) matches thrown down while alight, the glowing of the stick after use, the falling off of the red-hot head, &c. The latter class of risk was undoubtedly the most prolific in causing accidental fires. All these classes of risks were dwelt upon in detail; and the lecturer concluded this portion of his subject by expressing the opinion that they would be nearly eliminated if nothing but well-made safety matches with non-glowing stems were used. The price at which these could now be obtained would, he said, make it no great hardship if the use of ordinary phosphorus matches were prohibited, as was done in several European countries.

Professor Lewes next proceeded to deal with the ignition of woodwork, caused by faults in flues or by over-heating in the vicinity of a fireplace, as a cause of accidental fire; and he emphasized the point that dangers of this kind could only be got over by strict supervision during the building of a house, and by entrusting alterations and repairs only to men who thoroughly understood the work to be done. He explained that when wood is exposed to the long-continued action of heat it undergoes progressive changes nearly akin to those which took place during the conversion of vegetation into coal. Up to 100° C. (212° Fahr.), practically only moisture is expelled from the wood; and at a few degrees above this point, not only water but volatile hydrocarbons are slowly driven out. At 150° C. (312° Fahr.), however, oxides of carbon, together with more hydrocarbons, are disengaged; and at slightly above this temperature, the wood commences to assume a scorched appearance and turn brown. At about 250° C. (482° Fahr.), it is converted into a soft, brownish form of charcoal, which is its most dangerous form; being highly pyrophoric and self-igniting at comparatively low temperatures. At 300° C. (572° Fahr.), the carbon begins to assume the appearance of soft black charcoal—getting harder and more metallic in its properties as the temperature increases. As soon as 270° C. is reached, there is a gradual rise in the percentage of carbon, owing to the elimination of hydrogen and oxygen; and if contact of wood with a heated surface is continued for a sufficiently long period, a temperature only a few degrees above the boiling-point of water is enough to produce a semi-carbonaceous film upon the wood, which will begin to smoulder—the heat rising from an oil-lamp or a gas-flame some distance away, and even that given off from a steam-pipe, being sufficient to start it.

The lecturer now came to the fire risks due to lighting, which he said were of a most varied character. Even daylight itself was not free from danger; hundreds of fires having been caused by accidental focussing of the sun's rays by means of a full water-bottle, irregularities in the window-pane, or other cause which led to the concentration of the sun's rays upon some inflammable substance. Turning to artificial illumination, he pointed out that the great risk attending the use of a candle is that which is found with every movable source of light—*i.e.*, it may be placed in such a position that the flame can heat some inflammable substance—as when it is pushed under a projecting shelf, or placed on a toilet-table in such a position that the draperies or curtains can be blown in contact with it. With gas lighting, the dangers due to moving about a small unit are wanting; but swinging, and even fixed, gas-brackets placed between windows, where they are liable to come in contact with the curtains or other drapery, still remain a grave source of risk, while to the ordinary fire risks is now to be added that of explosion. Sliding chandeliers are responsible for a large number of explosions, owing to the evaporation of the water which forms the seal, or to the hardening of the packing which serves to keep the sliding tube gas-tight; the result being that the gas escapes without any previous warning—an accident which is liable to happen at any time. Leakage of gas into the air of a room may also be brought about by faulty fittings, the driving of a nail through the compo. gas-pipe, the extinction of a small flame, such as that of a bye-pass, by reduction of pressure in the mains, the turning off of gas at the meter at night while a burner is still on, and not discovering the fact before the meter is again turned on, and many other causes. When coal gas is lighted as it issues from the mouth of the burner, it burns quietly, sorting from the air the oxygen it needs for its combustion. But when from any accidental cause the gas leaks into the air of a room, an explosive mixture is formed when a certain proportion is reached, and contact with a lighted fire or taper at once produces explosion. The rate at which flame is propagated through mixed gases is dependent upon their proportions; a mixture of air and gas being only explosive between the limits of 8 and 29 per cent. of gas contained in it. The lower proportion of inflammable gas represents the smallest quantity which, when mixed with air, will burn rapidly, and so in large volume produce explosion. When the amount of gas rises above the upper limit, it will only burn where it is in contact with an additional supply of air, and does not explode; while it is only over a still shorter range that the explosion reaches its maximum power. The lecturer added that the risk of explosion from coal gas would be reduced to a minimum if only people could be induced to forego the luxury of searching for the leak with a lighted taper, or, at any rate, deferring the pleasure until open windows and doors had removed most of the smell of gas from the room.

Passing to the subject of the risks attending the use of oil as an illuminant, Professor Lewes said that, taking the fire returns for the year 1904, it might be imagined that these risks were less than those appertaining to the use of coal gas. This, however, was not the case, as, if the proportion per unit of light developed were taken, the risk for an equal amount of light from oil would be found to be enormously greater; while the average would have to be taken over many years, instead of over one, to present anything like a fair comparison. Up to 1852, there was practically but one kind of oil-lamp the use of which was fraught with any danger. In the ordinary domestic lamp, oils of both animal and vegetable origin—like sperm and colza—were employed; and, owing to their comparatively high point of ignition and freedom from inflammable vapours, they offered very little danger. But when coal gas first began to be introduced on a large scale, and attention was paid to recovering the bye-products from tar, the first distillate, consisting largely of benzene, was sold under the name of benzoline, or tar spirit, for use in outdoor flare lamps. The dangers attending these lamps were very much of the character of those found at the present time with lamps burning mineral petroleum spirit or petrol—*i.e.*, they gave off inflammable vapour even below the freezing-point. Unless it was most carefully stored, the escape of the liquid in the form of a heavy vapour produced not only explosive mixtures with air, but caused ignition of the vapour at a very great distance from the liquid—the flame then flashing back to the liquid itself.

The dangers for which the domestic lamp was responsible were due to two distinct sets of causes—the character of the lamp, and the flimsy construction of the cheap rubbish sold in poor neighbourhoods; and the quality of the oil itself. Taking the latter point first, Professor Lewes said it was the flash-point that was the factor of danger, for if this were too low, vapours capable of yielding explosive mixtures with air were given off and were liable to lead to very serious trouble. In 1868, the flash-point was prescribed at 100° Fahr. by the open test; but in 1879, it was lowered to 73° Fahr. by the Abel closed test. The oil, however, was really the same as before, only it flashed at 73° Fahr. by the new test as compared with 100° Fahr. by the old one. Much stress had been laid upon the importance of increasing the flash-point to 100° Fahr. by the Abel test, as being likely to minimize the dangers accruing from the use of mineral oil; but such high authorities as the late distinguished chemist after whom the new test was named and Sir Boverton Redwood agreed that the extra heat generated during the combustion of an oil having a high flash-point would entirely overshadow any diminution of danger resulting from its use. With regard to the first-mentioned matter—the character of the lamp—the lecturer remarked that if it were possible to abolish the rubbishy articles sold as oil-lamps, and at the same time do away with side-feeds and glass reservoirs, half the number of fires and accidents would disappear. As to the risks attending the use of these lamps, it was only necessary to say that, given a properly constructed lamp, with a soft, well-fitting wick, it was an excellent form of illuminant where coal gas was not available.

Last night, Professor Lewes dealt with the dangers of storage and the spontaneous ignition of material in bulk. Next Monday, in his concluding lecture, he will take up the subjects of fire prevention and extinction.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of this Association was held on Saturday, at the Manchester School of Technology. There was a good attendance of members to discuss the two papers to be submitted to them. The meeting having been formally opened,

Mr. F. THORP (Whitefield) read a paper on

SOME METHODS OF GAS MEASUREMENT.

Before commencing his paper, Mr. Thorp said he should like to thank the members for the kindness which had been extended to him during his membership. His connection with the gas industry was as a manufacturer; and the reason he had been unwilling to occupy the position of a reader of a paper had been that he had endeavoured to steer clear of business. They would, however, agree with him that it was extremely difficult to maintain this attitude when giving his experience in connection with the measurement of gas; and he felt that the welfare of gas engineers, the gas industry generally (from the consumer to the gas-plant manufacturer), and indeed the country itself, would be served by the furtherance of the scheme he would allude to in his paper. It was this belief that had given him the courage to overstep the line with reference to trade matters he had mentally drawn when joining the Association.

The members were all as well acquainted with the ordinary methods of measurement by means of wet and dry meters as he was; so that these could be passed over after referring to improvements which had been made of late in their construction. The improvement in wet meters had been principally to maintain a constant water-line, and in dry meters alterations of the ports. Efforts had, however, been made of late to increase the speed of the drum in wet meters by carefully designing the shapes of the various parts of the rotating chambers (this was a French invention); but there did not seem to be any great advantage over the ordinary station meter. With reference to dry meters, efforts had been made in America to reduce the size and cost by providing larger ports and increasing the number of chambers. But as to whether the life of these meters would be found quite satisfactory, it was as yet too early to speak; and, for some reason or other, they did not appear to have appealed to the British gas engineer. Other types of meters which might be said to be a combination of the wet and dry forms, seeing that the measuring chambers, though not rotating, worked in liquid, while the valves were similar to those used in dry meters, had of late years been introduced. He was not aware, however, that any special claim was made for their small size as compared with the ordinary wet or dry meters; and he was not prepared to say whether they were any decided improvement on the ordinary types. Proportional meters had also been installed for many purposes, particularly in America, for measuring natural gas. These meters were so constructed that only a relatively small portion of the actual volume of gas passing flowed directly through the measuring chambers; arrangements being made whereby the same relative quantities passed whatever might be the rate of flow. But apparently the results were not by any means accurate and satisfactory. This may be said to be perhaps the first type of inferential meter used for the actual measurement of gas as supplied in pipes. Another and very different method of measuring the flow of gas in pipes which had during the past few years been somewhat prominently brought before the public was the very ingenious Pitot tube (*ante*, p. 730). This consisted essentially of a device for ascertaining the difference of level between the surfaces of a liquid in a tube or its equivalent, caused by the flow of the gas in the pipe acting directly upon the surface in one leg of the tube and on the other at right angles to it, thus giving the velocity pressure only. Many experiments had been made with this form of apparatus, whereby the rate of flow could be ascertained (and in one form of the apparatus registered) at any particular moment, with a fair approach to accuracy. It could hardly, however, by any stretch of the imagination be said to be a reliable measurer.

Recently he had installed a registering apparatus on a similar principle to that of the burner-tester, for a flow of gas up to nearly 20,000 cubic feet per hour. From the chart so obtained, the rate of flow at any period could be seen at a glance, while it was a very simple matter to total up the daily volume of gas passed. The particular district where it was installed was one subject to road subsidence through mines; and it was hoped that any sudden increase of leakage would be traced by the character of the charts obtained. The anemometer was also a well-known instrument for ascertaining chimney draughts, the velocity of air in mines, &c.; and variations of it had been, and were still, in use, notably for measuring the volumes of compressed air to rock drills, &c. But until his firm took up the question, he was not aware that it had been used for the direct measurement of gases, with at all events, any reasonably low percentage of error.

The necessity for some system of gas measurement other than those of the ordinary kinds already alluded to had for many years been the subject of conversation by his father and Mr. Marsh, and latterly himself; and at last they determined to institute a series of experiments on a modification of the anemometer with a view to its use in a limited number of cases. The outcome of this was the present "Rotary" meter,* an instrument which had exceeded their expectations. It was often the case with the launching of any new type of apparatus, that difficulties were encountered in directions sometimes not anticipated; and the "Rotary" meter had formed no exception, seeing that it had been, and was being, used for many purposes where no system of measurement was previously in vogue. The "Rotary" meters had successfully measured gas at a temperature of 50° below zero; and gas had been passed through them as high as the boiling-point of water, and at pressures varying from 2-10ths to 5 lbs., and some were in course of construction up to 150 lbs. They were in use for measuring coke-oven gases, blast-furnace gases, air, Mond gas, water gas, and ordinary coal gas; and where the conditions had been at all suitable, they were giving general satisfaction.

As was only to be expected from their experience so far with ordinary meters, the "Rotary" meter would not work accurately under certain sudden fluctuations of flow, such as were produced by gas-engines; and this led them to devise a new form of anti-pulsator, the existing types not giving a sufficiently uniform pressure. One feature among others of this anti-pulsator was a new style of spring which his father had devised, and which had interested many scientific men. The peculiarity was that between certain limits the spring became weaker the more it was pushed or pulled, instead of becoming stronger, as with all other springs. This spring had enabled them to construct an anti-pulsator in which the bellows or diaphragms moved a distance of 6 to 8 inches with not more than 1-10th inch variation. For gas-engines, &c., the instrument answered admirably, oscillations of 3 inches being reduced to 1-10th inch. An additional advantage of the instrument was that it was also an efficient governor, and an engine fitted with one was ensured of a steady pressure, and the main freed from pulsations. For exhausters and the like, where the anti-pulsations might be subjected to high pressures, they had an entirely different type, which was totally enclosed. They were at present constructing a meter and anti-pulsator to be used in connection with gas-engines of 1100 and 1550 horse-power.

To return to the question of measurements, he wished to point out that, contrary to what one might have expected at first sight, the "Rotary" meter was not in the least affected by any varying density of the gas. As they would have surmised, the question of friction had been of the greatest importance. A fortnight ago he took to pieces a 60,000-feet meter, which had a bearing of the ball and flat type, in the presence of two eminent engineers, to enable them to see the effect of two years' wear; and he was glad to say that, even with the aid of a lens, they were unable to detect any wear whatever. The measuring fan of the meter weighed 5 lbs., and he calculated it had made 2,000,000,000 revolutions. Considering that it had not received any lubrication for two years, they thought this a very creditable performance.

The author concluded with some references to the "Discount" meter for use with gas heating and cooking stoves,† and the desirability of doing away as far as possible with coal-fires.

Mr. J. HALL (Manchester) next read a paper on

RAILWAY CARRIAGE GAS LIGHTING.

Mr. Hall commenced by expressing his pleasure at having the privilege of giving the members a brief history of the methods first adopted and now in use in lighting railway carriages by coal and oil gas; but before describing the works and plant used in the manufacture of the latter gas, he would give them the actual candle power received for 1d. from the various burners now in use. He would also make a few suggestions in the way of improvements as to cost, &c., in producing artificial illumination for railway carriages, as he was sure there was need of this.

The apparatus before the members was lent by Mr. George Hughes, the Chief Mechanical Engineer of the Lancashire and Yorkshire Railway. It consisted of a small cylinder containing about 10 cubic feet of oil gas at 50 lbs. pressure. The first lamp was fitted with two No. 000 Bray's burners giving six candles illuminating power with a consumption of 1 cubic foot each at 20-10ths pressure; the second lamp was fitted with a regenerative burner giving 12 candles; and the third had an ordinary inverted incandescent burner giving 36 candles. He also had before the meeting a portable table-lamp burning ordinary petroleum, and fitted with an incandescent mantle giving between 60 and 80 candles illumination. The cost in oil used was about 1d. per day, consuming about one inch of wick per annum. A really good duplex oil-burner, with a consumption of 50 grains of oil per hour, would give one candle illumination, and with a good circular-wick burner and 45 grains of oil consumption, one candle per hour; or, taking a fair average lamp oil at 8d. per gallon, equivalent to 1d. per pound, it would give about 140 candles for 1d. For this sum they would get from the ordinary flat-flame gas-burner 55 candles; from the incandescent mantle, with coal gas at 15-10ths pressure, 470 candles; from compressed coal gas at 80-10ths pressure, 1000 candles; and from compressed oil gas, at 60 lbs. pressure, 1200 candles.

Coming to the subject of the paper, Mr. Hall said it was about thirty years since one of the leading English Railway Companies first introduced coal gas for carriage lighting. The gas was

* See "JOURNAL," Vol. LXXIX., p. 1762; and Vol. LXXX., p. 1282.

† *Ibid*, Vol. LXXXVI., p. 439.

obtained from the town mains at ordinary pressure, and passed through a 400-light meter into two large cylinders. When these were filled, the gas to the meter was shut off, and a valve connected to the first cylinder opened, which allowed an inrush of water (at 60 lbs. pressure) from a private main. There was also a valve fixed between the first and the second cylinder; and after the gas had been compressed by the rising water from the former to the latter cylinder, the valve was closed, and the water in the first cylinder was drawn through a valve fixed at the lowest point. Before this valve was opened, the gas at the meter was again turned on; and as the water escaped, it sucked into the cylinders a new charge of gas. The operation of compressing was then repeated as before. After being compressed, the gas was conveyed through rubber piping to a holder fixed in the guard's van. It was square-shaped, made of strong canvas, and had a capacity of about 100 cubic feet. It operated just like a bellows, and was strengthened by cane or wood bands. Wrought-iron pipes conveyed the gas from the holder to the lamps in the various coaches —rubber connections being made between each coach; and increased pressure was obtained by a weight fixed to the top of the holder. The gas consumption of each lamp was about 5 cubic feet per hour, giving 2 candles illuminating power per cubic foot. The lamps were much larger than those now in use, and the system was not generally adopted, though it was found to be practicable. No doubt coal gas would again be adopted, but applied in a more approved and up-to-date manner. Perhaps it could be made practicable to charge the storage cylinders with coal gas—say at 20-10ths pressure—which could be obtained from the town mains, and then increase this pressure with a special hand pump which could be attached to the cylinder, adding an additional cylinder to each coach, charging these with compressed air at high pressure, and delivering the gas by separate pipes to each lamp, joined on to the low-pressure gas-pipe near the point of ignition—making the gas automatically mix itself in the burner with the right proportion of air. This would allow the gas to be used at a very low pressure. If this arrangement could be made to work satisfactorily, a great saving would be effected, as the existing oil-gas works could be dispensed with; and considering the low price of coal gas — viz., 2s. 3d. per 1000 cubic feet, against 13s. 6d. per 1000 cubic feet for oil gas—it would mean a saving all round. If so desired, the compressing could be done by the machinery now in use at the various works; but this would make the scheme more expensive, owing to the upkeep of the underground mains, maintenance of works, &c. He was unable to see why a suction-gas plant could not be adapted for railway carriage lighting, as a very small plant would be required, and possibly it could be fitted into the locomotive tender.

Mr. Hall went on to refer to the experiments recently made with incandescent gas lighting for railway carriages. The incandescent burner experimented with was of French make, and constructed to suit the existing lamps. It was simply an ordinary incandescent burner, only smaller than usual. The mantle was in proportion, and measured 1½ in. by ½ in., and was supported by a wire rod attached to the burner and also to the mantle. No anti-vibrators were used, as the best results were obtained without them. A test made gave 24 candles per 0·5 cubic foot of gas per hour, against 6 candles per 1 cubic foot consumption with a No. 000 Bray's burner, which was generally used for carriage lighting. The life of the mantle was about 150 hours, and the coach in which the burner was fitted travelled about 1300 miles. Experiments had also been made with an inverted incandescent burner, which was found to give much better results than the vertical burner—being 36 candles per 0·5 cubic foot of gas per hour. The mantle used was of the small "Bijou" pattern, enclosed in fine wire netting, so that in case the mantle was broken the parts would be kept from falling away, and some kind of light be relied upon until the mantle was replaced.* The approximate life of a mantle was 200 hours; and the distance covered by the carriage about 1300 miles. It would be seen by these tests that the advantages of the incandescent system were enormous. So great were they, in fact, that it might be safely said that no other system at present known for the purposes of lighting railway carriages could compete with it.

Turning to compressed coal gas, the author said it had been taken up by a foreign railway company, who put down an engine capable of compressing 350 cubic feet of gas per hour to about 17½ lbs. pressure; and the first carriages lighted by it commenced running in May, 1905. But another installation was put down by a gas company in August of the same year; the motive power being supplied by a 7-horse power gas-engine. The compressing plant consisted of two cylinders arranged tandem fashion; the driving-shaft making about 200 revolutions per minute. The gas after compression was stored in cast-iron receivers fitted under the coaches—their capacity varying from 7 to 20 cubic feet; and they were charged up to 38 lbs. pressure. The burner used was regulated for a consumption of 1·3 to 1·4 cubic feet of coal gas per hour, at a pressure of 71-10ths, producing a light of 32 candles; while with about 0·5 cubic foot of compressed oil gas, at 48-10ths pressure, it gave 30 candles. This proved that it required 2½ times as much coal gas as oil gas to obtain the same illuminating power. [Reference may be made to the paper read by M. Naudé at the meeting of the Société Technique du Gas en France last June. See "JOURNAL," Vol. XC., p. 959.]

* The latest type of railway carriage lamp is shown in an article on page 859.—ED. J. G. L.

The author concluded by saying that compressed oil gas had been in use for nearly thirty years for lighting railway carriages, and had proved to be the best means of doing this safely and efficiently. The system had been adopted by most of the railway companies all over the world—more than 130,000 carriages and 4000 locomotives having been lighted, of which about 65,000 had been fitted up in the British Empire and about 36,000 in Germany. Even in America, where the electric lighting of railway carriages had been extensively tried, the compressed oil-gas system was now adopted throughout. Though oil gas was more expensive than coal gas, it afforded much greater illuminating power, as ordinary London coal gas gave the light of 16 candles when used with Sugg's "London" argand burner, consuming 5 cubic feet of gas per hour, while oil gas gave between 50 and 60 candles under the same conditions.

A hearty vote of thanks was passed to Messrs. Thorp and Hall for their papers.

In the course of the proceedings, a resolution was unanimously passed congratulating Mr. T. Armstrong, a member of the Association, on his appointment as Manager of the Ilfracombe Gas-Works; and it was decided to communicate it to him. In a letter to Mr. Garlick, Mr. Armstrong had expressed a wish to remain a member of the Association.

NOXIOUS EFFLUENTS FROM SULPHATE WORKS.

At the Meeting of the Yorkshire Section of the Society of Chemical Industry held in Bradford on Monday last week, a paper on "The Avoidance of Noxious Effluents in the Manufacture of Sulphate of Ammonia" was read by Dr. J. Grossmann, of Manchester.

The author pointed out that in the manufacture of illuminating gas, and in the modern process used in the production of coke, large quantities of ammonia are given off in the gases. In the process of extracting the ammonia from these gases for the purpose of converting it into sulphate of ammonia, waste liquors are produced which at present are turned into the sewers or into small streams. These liquors were, he said, of a highly noxious quality, injurious to vegetation, to fish life, and to field or cattle pasture bordering on the streams. The matter had become a serious one in Yorkshire, where there were about twenty coke-oven works producing these waste liquors, which in many cases were turned into streams. As coke-oven works were often situated in rural districts, it happened that a small village containing only a few hundred inhabitants might produce as much noxious effluent as would otherwise be generated by a gas-works belonging to a town of 100,000 or 200,000 inhabitants; so that the injurious effect of an effluent from coke-ovens in country districts, in proportion to the population, might be a thousand or two thousand times as great as that produced by an ordinary gas-works situated in a town.

Dr. Grossmann went on to say that there were two principles on which one might proceed in order to remedy the nuisance caused by these waste liquors—first, by purifying the liquors; and, secondly, by avoiding their formation. After going carefully into the question, he said he had come to the conclusion that the purification of the effluents as at present formed would be impracticable; and his method was therefore based on the principle of avoiding their formation altogether in the process of manufacturing sulphate of ammonia. He gave a description of his process, which will be found in detail in the specification of his patent No. 20,837, dated Oct. 14, 1905. Its main features are that the ammoniacal liquor is treated in the usual still, but without lime; and part of the liquor coming from the still is evaporated to small bulk. Chloride of ammonium and cyanogen compounds are recovered by a simple method, and the concentrated liquor may be used in the saturator. The other part of the liquor from the still is used again in the scrubbers after being cooled. The additional revenue obtained by the process—from the recovery of ammonium chloride, cyanogen compounds, saving in lime, and a better yield of sulphate of ammonia—should, the author considered, come to from 20s. to 40s. per ton of sulphate. The additional cost of working the new process where there are waste heating gases, would, he said, be very small; while in places where no such gases were available, it should not, even including depreciation and amortization, amount to more than 10s. per ton of sulphate.

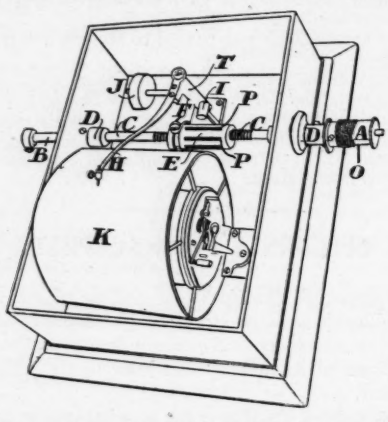
Dr. Grossmann concluded by pointing out that his process had not been designed with a view to effecting a saving in manufacture, but of altering the old process in such a way that it will comply with such sanitary conditions as may reasonably be imposed upon the manufacturer; and he considers that if it will accomplish this without extra charge to the manufacturer, it will have done all that can be reasonably expected.

An interesting discussion followed, in which Dr. H. Maclean Wilson, the Chief Inspector of the West Riding Rivers Board, and other gentlemen interested in the subject, took part. Dr. Maclean Wilson laid stress upon the great importance of this question to Yorkshire in particular, and expressed the hope that manufacturers would use their best endeavours to comply with the sanitary enactments, and find some means of abating the nuisance at present existing.

REGISTER OF PATENTS.

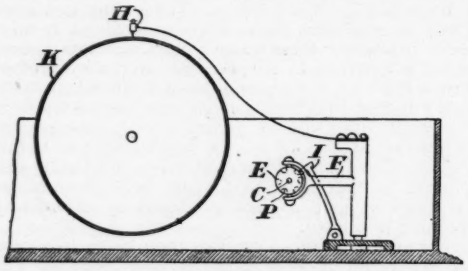
Indicating and Recording Variations in Depth of Water in Reservoirs.—Davies, D. E. L., of Birmingham. No. 4335; March 2, 1905.

In this recording apparatus, a clock movement causes the revolutions of a drum upon which a chart is carried, upon which the variation of level is indicated by a pen or pencil attached to an arm to which motion is imparted in the following manner: A float rests upon the surface of the liquid; and attached to it is a cord which passes over a pulley keyed upon a suitable shaft. A part of the latter is formed as a screw. A grooved sleeve or nut travels on the screw, and actuates a



bifurcated lever working on a pivot carrying the arm with its pen or pencil. A weighted pawl is provided for disconnecting the instrument during the changing of the charts (the pawl drops into the slots formed upon the nut); and to prevent back-lash a weight is used.

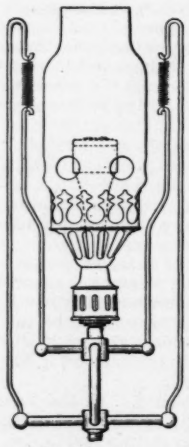
K is the drum; H, the pointer which moves on it; O, the cord attached to a float (not shown). A is the pulley around which the cord is wound; and D are the bearings upon which the screw shaft C



works. E is the sleeve or nut, and P the slots into which a pawl I drops when it is desired to disconnect the instrument. F is the lever, through the medium of which the pointer working upon the pivot T is actuated. J is the weight which takes up any back-lash. A counter-weight (not shown) may be suspended from the shaft at B, or from the same pulley as that which carries the float.

Anti-Vibration Gas-Fittings.—Dellow, J. E. & C. W., of Oldham. No. 5606; March 17, 1905.

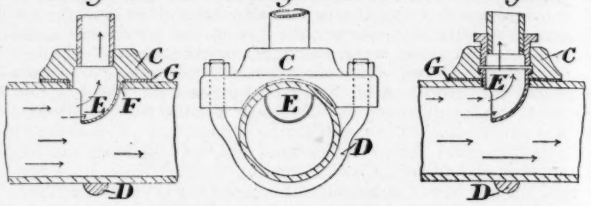
This invention in anti-vibration gas-fittings consists in providing a union or nipple (for attaching to the gas supply pipe) having extending from its arms forming part of, or supporting, a rigid stationary frame consisting of upwardly extending arms from the upper ends of which are suspended springs, while the lower ends support arms forming part of, or connected to, a cross piece or bar supporting a central screwed tube, to which the lower end of the gas-burner is attached. The union or nipple is connected to the tube by a rubber or like flexible tube or tubes, to conduct the gas from the supply pipe to the mixing-chamber of the burner. The use of these latter tubes and the springs "enable any vibratory shocks imparted to the rigid frame to be absorbed, and consequently prevented from reaching the delicate mantle employed in this system of gas lighting." In other words, the whole of the burner proper, and its connected parts, is suspended between flexible mediums, thereby enabling these parts to swing or float without injury to the mantle. In all cases the springs are fitted at the sides of the burner "to prevent any injury being done to them by heat."



Attachment for Connecting Branch Pipes to Mains in Water and Other Pipes.—Mawle, E. E., of Mansfield. No. 10,504; May 19, 1905.

This invention relates to means for connecting small pipes to main pipes by a saddle with an internal deflecting lip in such a manner that the branch pipes may be connected to the main when the latter is already fixed in position, and without the necessity of providing a special T-piece or other specially-prepared connection; also "for effecting this purpose in such a manner that the flow of liquid is diverted to or from one to the other without causing undue friction or loss of head."

Fig. 1. *Fig. 2.* *Fig. 3.*



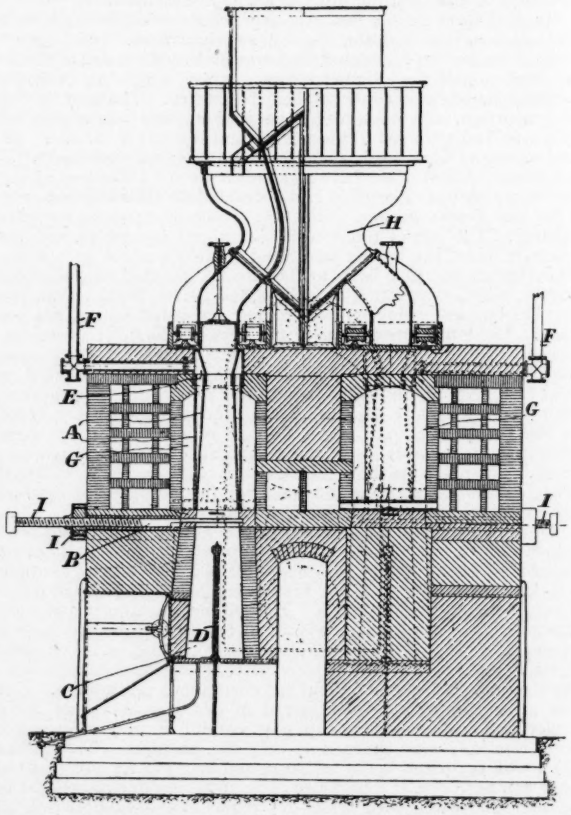
The illustration shows the pipe attachment with the internal lip facing the flow of water and guiding same from the main pipe into the branch pipe; but the invention is equally applicable for guiding the water from the branch into the main pipe, in which case the internal lip would be turned in the opposite direction to that shown.

The saddle C is attached to the main pipe, and held fast by a loose clip D, and is screwed to receive the branch pipe. E is a curved lip cast on the saddle, and projecting inside the main in such a manner as to divert the flow of water either into or from the branch pipe; F is a hole drilled into the main pipe, to form a connection with the branch pipe; and G is a ring of rubber or other material to make a joint round the hole.

Figs. 1 and 2 show the internal lip E, cast on to the saddle C; but it is equally applicable with the lip made separate from the saddle and fixed as shown in fig. 3, in which a screwed gland or bush could be used for connecting the branch pipe in the saddle. The lip E in this case, being separate from the saddle, is made into a projection round the top edge, so as to rest on a shoulder cast inside the saddle.

Vertical Retorts for Producing Coal Gas and Water Gas.—Rummens A., of Koekelberg, near Brussels. No. 9151; May 1, 1905.

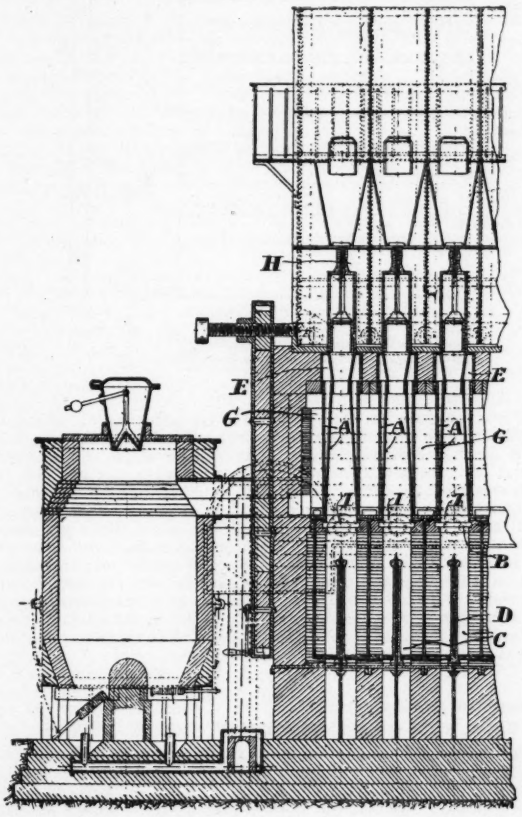
In the "JOURNAL" for Jan. 2 (p. 31), a brief description appeared of the construction and arrangement of M. Rummens' patented device for the production of coal gas and water gas in vertical retorts. Further details are, however, now available—on the publication of the English patent specification; and it will be well therefore to reproduce the illustrations that appeared earlier in the year, so as to make the following details abundantly clear.



The invention has for its object "to provide an improved furnace with a plurality of vertical retorts for the simultaneous production of coal gas and water gas." As the *raison d'etre* of his patent, the inventor says: "The improved gas-furnace of my present invention is characterized in that the water gas is produced in the coal-gas furnace itself by utilizing the heat of the incandescent coke coming from the retorts, which are arranged vertically. In this way, a further reduction of the cost of manufacture is obtainable by the addition of an ordinary

quantity of water gas to the coal gas immediately after the production thereof in the retorts. The mixture of gases obtained under these circumstances forms a steady incondensable gas, similar to the pure coal gas, but less expensive; and the lighting and heating power of which suits the same for lighting, heating, motive, and other purposes."

Broadly stated, the furnace is arranged as follows: The vertically arranged retorts have a movable bottom and double side-walls; the outer wall being plain and vertical, while the inner wall is perforated and conically widened towards the bottom, for the purpose of easily discharging the incandescent coke by its own weight into a lower closed chamber when the bottom of the retort is withdrawn—the coke being not at all cooled in contact with the atmospheric air. The vertical retorts are provided at their upper part with special lids or tops, permitting of simultaneously and quickly closing and opening all the retorts of the furnace; so that they may also be charged simultaneously and quickly. The incandescent coke received in closed receptacles arranged below the vertical retorts serves to produce superheated steam in non-explosive vaporizing devices, arranged within the closed receptacles and surrounded by the incandescent coke. The steam produced in the vaporizing apparatus is "brought therefrom, through the fire-proof retort-supports, into the retorts and converted into a certain quantity of water gas, obtained in an economical way and which is mixed at a high temperature with coal gas produced by distillation in the usual way."



In the form of construction shown, the inner wall A of each retort is provided with longitudinal slots of any desired form and arrangement. The provision of retorts with double walls serves the purpose of permitting the gas to reach the pipes F without being obliged to pass through the whole incandescent mass of coal; the gas produced flowing directly through the apertures of the retort wall into the annular space between the double walls, and thence into the pipes. The inner wall is surrounded by an outer plain wall or casing provided with a base I, the opening of which serves for the discharge of the retort. The base is provided with an inner groove engaged by, and adapted to guide, the movable bottom of the retort. The inner wall is conically widened towards the bottom as shown, and is supported on an annular projection of the base. The upper ends of the walls are surrounded by a hollow retort-head E, the inner space of which is in communication with the pipe F, so that the inner spaces form an extension of the space between the walls of the retort. During the distillation of coal, the head is tightly closed by a stopper lined with fire-proof material and provided with an operating screw-spindle.

The retorts are closely arranged side by side within the heating spaces or chambers G, and supported on fire-proof blocks forming the side-walls of the lower closed receptacles.

The chambers G are heated by the gases produced by the vertical generators attached to the gases passing through two longitudinal flues, separated by a partition wall. The gases circulate in opposite directions; so that the temperature is practically uniform throughout the entire length of the flues. The gases pass through transverse flues into the intermediate spaces between the retorts, and thence into the regenerating chambers, arranged parallel with the heating-chambers G and at the same height.

The transverse flues, which cross the heating-chambers, are provided in their central portion with an inner projection, above which is an opening. By this arrangement the heating gases meet with the air circulating in opposite directions and previously heated in the regenerating chambers, in the central parts of the combustion chambers; so that the heating flames rise in the axis of the intermediate spaces between the retorts—the flames surrounding the retorts and heating them uniformly throughout the entire height. The combustion gases pass through the lower openings into the regenerating chambers, and are discharged through flues into the chimney of the furnace. The flues are surrounded on three sides by a hollow casing, in which the air serving to produce the generator gas is reheated. The reheated air is then brought below the annular grate, composed of a plurality of sections, adapted to be lowered individually, whereby the grate may be readily cleaned.

The closed chamber below each retort is widened towards the bottom, and provided in its lower part with a discharge opening, normally closed by a fire-proof cover, arranged on a small carriage, the wheels of which run on two guide-ways provided on the side-walls of the cast-iron lining or fitting having an inclined bottom. The coke discharged from the closed chamber drops upon the inclined bottom and thence into the coke-barrows.

The steam necessary for the production of water gas to be mixed with the coal gas is produced in special vaporizing apparatuses D, arranged in the centre line of the closed chambers and heated by the incandescent coke discharged from the retorts. Each vaporizing apparatus is composed of three concentric tubes surrounding a solid iron core, adapted to be moved upwardly and downwardly, and which may be used as a poker for causing the dropping of the coke from the retorts in any cases. The inner tube is frictionally arranged around the iron core, while an annular space of about 1 foot is left between the tubes. The annular space is in communication with the pipe, through which the water to be vaporized is admitted to the base of the apparatus. The water is not admitted into the vaporizing devices until the temperature of the distilling coal is sufficiently high to completely convert the steam passing through the retorts to water gas—that is, carbonic oxide and hydrogen without any formation of carbonic acid.

It is well known, the patentee here remarks, that in existing water-gas generators the carbonic gas is produced at a temperature of about 600° to 700° Celsius, and the water will not be admitted into his vaporizing devices until the temperature is raised far beyond 700° Celsius. Furthermore, the cooling of the retorts is avoided by first producing small quantities of water gas, and then gradually larger quantities; and in order to prevent the temperature from being lowered below 700° Celsius, the retorts are very strongly heated just before the introduction of water.

The quantity of water gas to be mixed with the coal gas is limited only by the cooling of the incandescent coke in the lower closed chambers; and as this cooling is caused only by the heating of the vaporizing devices—that is, the production of superheated steam—it will be very slow. The quantity of water gas which can be mixed with the coal gas is therefore rather large. Furthermore, during the formation of water gas in the distilling retorts the largest part of the liberated hydrogen will be carburetted in contact with the carbonic substances, whereby the quantity of non-condensible hydrocarbons will be increased.

It will be noted, the inventor points out, that, in his system of furnace, three distinct periods of gas formation will take place: (1) A first period during which coal gas of first quality is exclusively produced until the temperature is raised to 800° or 900° Celsius. (2) A second period, during which the temperature is maintained above 700° Celsius and suitable quantities of water are admitted to produce one or several times a mixture of coal gas and water gas. (3) A third period, during which the distillation of coal is completed at a high temperature (700° to 1200° Celsius) for the production of a large quantity of coal gas of less quality.

By reason of the arrangement of the furnace, mechanical devices may be used for charging the vertical retorts and discharging the incandescent coke into the lower closed receptacles or chambers when the distillation is completed. The charging device shown is formed of two parts, each of which is provided with a number of receptacles, alternately open and closed at the top, and which are all open at the bottom. The receptacles closed at the top serve to close the bottom of a number of charging-funnels, arranged above the retorts, during the admission of a charge in the funnels through a slide, arranged at the bottom part of the coal-hopper. The bottom of the hopper is formed with two inclines, whereby the introduction of coal into the charging-funnels is facilitated.

Now, when the charging device is moved to half the distance between the centre lines of two successive retorts, the compartments closed at the top will be brought to the position of the compartments open at the top and *vice versâ*, whereby the charged funnels are brought into communication with the retorts, which are thus charged with coal simultaneously. Hereupon the charging device is moved in opposite direction to bring a closed compartment over each charged retort, and close again the bottom of each funnel, so that a fresh charge of coal may be filled into the latter during the distillation.

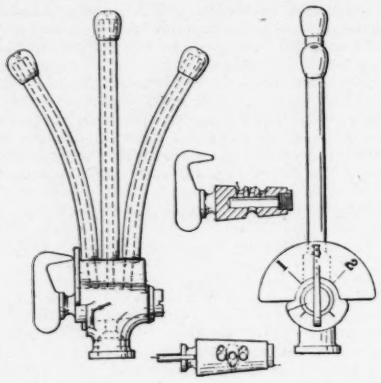
Arranged within each closed compartment is the stopper provided with a screw-spindle, whereby the retort is tightly closed after charging. Prior to the charging of the retorts, the stoppers are somewhat raised by the operating spindles.

Before the admission of a fresh charge into the retorts, the incandescent coke contained in the latter must be discharged into the lower closed chambers by simultaneously opening the movable bottoms of the retorts. The simultaneous opening and closing of the bottoms may be obtained likewise by means of screw-spindles and toothed screw-nuts; the number of the latter corresponding to the number of retorts, and which are arranged to mesh with intermediate gear-wheels of equal diameters and toothing.

Stop-Cocks to Control the Passage of Gas to Multiple Outlets.—Ballinger, T., of Yelverton, and Kirk, T., of Plymouth. No. 11,103; May 27, 1905.

This invention relates to gas-light fittings having several branches springing from one stem in which there is a stop-cock, so that any or

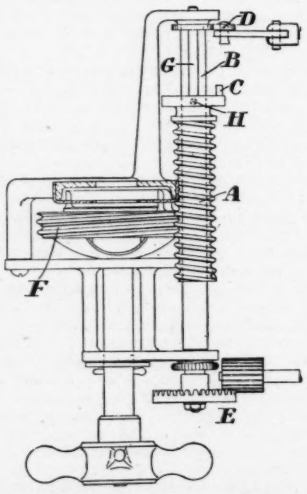
either of the branches can be used at will. At the junction of, and between, the main pipe and the branches, is a stop-cock having a barrel into which on the one side opens the supply pipe and on the other openings to the various branches. The plug or tumbler to control the supply to any individual branch, or any combination of the branches, is arranged as shown. The plug of the stop-cock is provided



with a channel, in the line of its axis, of suitable size and of sufficient length to reach the outside holes in the barrel supplying the outside branches; and this communicates during a considerable portion of the movement of the plug with the supply pipe by a channel passing centrally around nearly the whole of the plug and opening into the central chamber. Then, by cutting openings corresponding with each branch and leading into this central chamber, access is provided from it to each of the branches. The openings, which, when all the branches are in communication at one time, are represented by round holes, are channelled off at right angles to the axial line, so as to provide a conduit to the various branches in such manner that the movement of the tumbler or plug shall successively supply the branch pipes, and by means of the holes and right-angle grooves enable the use of the branches to be controlled at will.

Prepayment Meters.—O'Connor, H., of Edinburgh. No. 11,164; March 29, 1905.

In prepayment meters—where the travel of a worm on a spindle causes the closing of the valve, and which spindle and worm are rotated by gearing with the ordinary registering mechanism of the meter, the patentee proposes to provide for the worm to gear into a second worm attached to, or connected with, the coin-receiving mechanism; this second worm being screwed the opposite hand to that on the spindle, so that the threads of both may gear into one another. In prepayment meters where a partial turn only of the coin-receiving mechanism is given after each coin has been inserted, he makes the second worm of two or more threads according to the amount of turn desired. Thus where a half-turn is desired, the second worm has a double thread, and the worm on the spindle a single thread. Then, in operating the coin-receiving mechanism through the half-turn, the second worm causes the other worm (then acting as a rack) to travel axially along the spindle the distance of one of its threads; and a rotation of the spindle by its gearing with the ordinary registering mechanism of the meter causes a rotation of the worm upon it, which worm, being in gear with the second worm on the coin-receiving mechanism (then acting as a



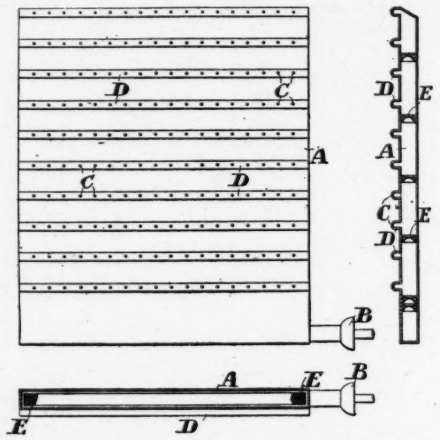
partial nut), is screwed back the distance of one of its threads. The "general principle" of the above is not claimed as new.

A is the worm, free to travel axially along the spindle B, and, by the pin C through the lever D, cause the closing of the prepayment meter valve. The spindle and worm rotate together by gearing E leading from the ordinary registering mechanism of the meter. Gearing into the worm is another worm F, screwed the opposite hand to the worm A. The worm F is shown as a double worm, so that only a half-turn is required to cause the worm A (then acting as a rack) to travel axially along the spindle the distance of one of its threads. When the ordinary registering mechanism of the meter is rotated by the passage of the gas, the spindle gearing with it, through the gearing E, is also rotated, rotating with it the worm A, through the groove or slot G and pin H engaging with one another. The worm A, being in gear with the worm F (then acting as a rack or nut), travels, also axially, along the spindle the distance of one thread in the opposite direction to that in which it travels when moved by the worm F acting as the driving worm.

Gas Heating-Apparatus.—Barclay, C. H., of Woburn Square, W.C. No. 16,010; Aug. 4, 1905.

This invention, relating to atmospheric gas-burners, comprises a "novel arrangement" whereby "a very large amount of heat compared with the consumption of gas is obtained."

A is the chamber of the burner, into which the mixture passes; and B is the usual mixing-chamber through which the gas and air are introduced. C are the burner holes through which the gas issues—preferably made in hollow ribs D, formed upon the wall of the chamber. E are diaphragms or partitions of wire gauze extending across the chamber and through which the combustible mixture passes. The

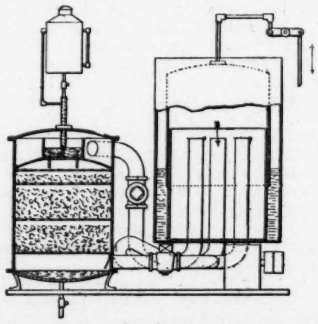


partitions are placed in such positions in the burner as "to ensure that the combustible mixture shall burn with substantially uniform flames at all the burner-holes throughout the entire height of the burner, instead of burning with large flames at the upper part and with relatively small flames at the lower part, as would be the case if no obstructions were placed across the chamber." The partitions also serve "to atomize and thoroughly mix the constituent parts of the combustible mixture" and also "to conduct heat from the walls of the chamber to the interior," and so superheat the combustible mixture prior to ignition that "complete combustion is obtained with the corresponding production of an intensely hot flame." The gauze partitions also serve as a safeguard against the lighting-back of the combustible mixture in the burner. A pair of diaphragms is placed close together (adjacent to the gas-inlet) for this purpose.

Carburetted Air Gas.—Arzt, A. H., of Cavendish Square, W., and Baron, S., of St. John's Wood, N.W. No. 24,242; Nov. 9, 1904.

This invention relates to apparatus for the production of carburetted air gas for illuminating and heating purposes; and it has for its object to continuously generate, store, and supply a gas composed of a hydrocarbon vapour, together with suitable proportions of air and hydrogen, by means of an apparatus which is automatically regulated so as to accelerate or retard the generation of the gas according to requirements, and to stop the generation when the gasholder is full.

The gas is of the kind that is generated by vaporizing light hydrocarbon oils or spirit, in contact with a porous, siliceous material, by means of an air current passed over or through it.



The air is concurrently blown into a carburettor and into a gasholder arranged as shown. The air, on entering the carburettor, encounters a finely-divided supply of liquid hydrocarbon, which is caused to pass through or over "a suitable material capable of yielding silicic hydride." The silicic hydride is immediately decomposed; the silicon being oxidized, while the nascent hydrogen unites (in the cold state) with the vapour, which then passes off in the form of a gas into the gasholder, where it mixes with the atmospheric air blown therein. The combustible mixture then passes through a pipe and pressure-

regulator to the service-pipes, to supply the burners of the illuminating or heating appliances. The gasholder is water-jacketed, and is provided with a rising and falling bell (or is otherwise expansible) adapted to act on any suitable means in connection with the motor or blower, and so automatically check the generation and supply of the gas on the holder becoming filled.

The carburettor is provided internally (as indicated) with a series of perforated trays or plates, on which is placed the porous material above referred to—such material being preferably in the form of pebbles, slabs, or blocks. The porous material which has been found "eminently suitable for the purpose in view" may be prepared as follows: Powdered magnesia (MgO) and silica (SiO_2) are intimately mixed together and worked into a stiff paste with a bare sufficiency of a saturated aqueous solution of table salt—sodium chloride (NaCl). The paste is then pressed or moulded to the required form, then air dried, baked at a low temperature, and, when sufficiently cooled, impregnated with tri-ethyl-silico-formate $SiH(OC_2H_5)_3$, which it readily absorbs in large quantities. The sodium of the salt assists the decomposition of the silicic ether, and silicic hydride (SiH_4) is given off, which is, in turn, decomposed by the oxygen of the air—the nascent hydrogen uniting with the aerated hydrocarbon vapour. This counteracts the liability of the vapour to condense, under the influence of low temperatures or moderate pressure, or of friction.

APPLICATIONS FOR LETTERS PATENT.

5812.—Russell, T. T., and Gritton, W. H., "Electrically lighting, controlling, and extinguishing gas-lamps." March 10.
5931.—Colson, A., "Prepayment meters." March 12.
5974.—Jacob, C. & P., "Incandescent burners." March 12.
5982.—Harriss, G. M., "Meter recorders." March 12.
5992.—Imray, O., "Pipes or conduits." A communication from the Safety-Armorite Conduit Company. March 12.
6039.—Steel, Peech, and Tozer, Ltd., Pursglove, W. T., and Renton, R., "Regenerative furnaces." March 13.
6043.—Gardner, A., "Furnaces." March 13.
6051.—Beard, E. A., "Hydrocarbon gas." March 13.
6062.—Clark, A. Z., "Agitator for gas-washing." March 13.
6086.—Hoare, G. C., and Sheat, H. L., "Inverted fittings." March 13.
6111.—Godson, R. S., "Three-way gas-taps." March 13.
6131.—Mason, J., "Anti-vibrator." March 14.
6134.—Fisk, J. W., "Inverted mantle-holders." March 14.
6144.—Galbraith, J., "Acetylene-generators." March 14.
6174.—Ury, S. H., "Gas-burner attachments." March 14.
6204.—Cole, W. L., and Ludbrook, S. W., "Discharging and charging gas-retorts." March 14.
6229.—Bosshardt, F., "Gas-turbines." A communication from Frikart and Jaeger. March 15.
6251.—Bolle, C., "Anti-vibrator." March 15.
6253.—Bush, A. W., and Napper, S., "Gas-fittings." March 15.
63 9.—Wolfson, J., "Mantle supports." March 15.
6398.—Parkinson, W. C., "Coin-freed gas-meters." March 16.
6425.—Howorth, F. W., "Gas-pressure regulating devices." A communication from Aktiebolaget Gasaccumulator. March 16.
6432.—Sensenschmidt, M., "Hardening incandescent bodies." March 16.
6441.—Electrical Improvements, Ltd., and Hacking, A. E., "Electrical ignition of gas-lamps." March 17.
6454.—Lea, J. E., "Measuring and recording the flow of liquids or gases." March 17.
6497.—Hall, J., "Gas-furnaces." March 17.
6507.—Moss, T. & W., "Pumps and meters." March 17.
6509.—Little, T. J., jun., "Atmospheric burners." March 17.

Gas-Main Extensions at Shipley.—The Local Government Board have intimated to the Shipley Urban District Council their sanction to loans of £3800 for gas-mains, £800 paid to the Bradford Corporation for mains, £6200 for mains laid during the past six years, and £650 for the erection of gas-lamps. The Board object, however, to the expenditure of £6000 in extension of the gas-works; stating that the Shipley Act prevents this sanction being granted. The Urban District Council have resolved that a further representation on the latter subject shall be made to the Local Government Board.

Price of Gas in Southampton Out-Districts.—The Bitterne Parish Council having written informing the Itchen Urban District Council that they were going to make an attempt to secure a reduction in the price charged for gas by the Southampton Gas Company, and asking for the Council's aid, Mr. Methven said he should support the idea. They in the district should not pay 6d. per 1000 cubic feet more than was paid in Southampton. Woolston people might fairly be asked to pay a little more than Southampton, owing to the length of the mains; but as the district had increased until it was now a township of 14,000, they should be looked upon as a town, and treated accordingly. He moved that the Council support the Bitterne Parish Council's action. This was agreed to.

Gas Lighting in Westminster.—The Highways Committee of the Westminster City Council reported last Wednesday that the Assistant City Engineer had informed them that, owing to a serious leakage of electricity in the stables at the Ebury Bridge Depot, probably due to defective wiring, there was great danger of fire; and the officials of the Westminster Electric Supply Company, on being asked to come in, condemned the entire installation, and cut off the supply. The Committee had decided that it would be more economical to put in gas; and they had given instructions accordingly. The Finance Committee reported that the Gaslight and Coke Company had finished the work of fixing the 19 columns, &c., required for the lighting of Aldwych, at a cost of £380. The Company had offered to allow a discount of £30 if the whole amount was paid forthwith, instead of in five annual instalments according to the agreement; and the Committee had agreed to the proposal.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

Hire of Gas-Cookers in Public Elementary Schools.

Sir,—I have received from the Local Education Authority a letter respecting the hire of a gas-cooker, intimating "that a decision has been made by the Board of Education to the effect that the Managers of a School and not the Local Education Authority are responsible for the purchase, or, in default of purchase, for the hire, of gas-cookers required for instruction in a Public Elementary School."

This is a matter which affects gas companies all over the kingdom; and as the Local Education Authority is responsible for the provision of the furniture, books, and apparatus necessary for instruction given on other subjects, I think if the matter were taken up with the Board of Education by the Institution of Gas Engineers, the former might be induced to alter their decision relating to gas-cookers.

Chester, March 20, 1906. Fred. A. Pye.

Purification Results.

Sir,—I did not intend writing another word on this matter; but if Messrs. Samuel Cutler and Sons will continue to try and compare conditions that are not comparable, I must remind your readers that my letter in your issue of the 13th inst. is still unanswered, and that I have nothing more to add to it.

I think that all gas engineers now have an object-lesson of how much reliance should be placed on manufacturers' statements as to the benefits to be derived from any make of goods, when they are competing with another make of similar articles. If Messrs. Cutler and Sons keep on, they will soon outrival the coal agents with their analysis sheets.

But now to another matter. I am sorry that Mr. Hill has been unable to understand my figures. I stated at Manchester that we have here eight purifiers, 20 ft. by 20 ft. by 5 feet, worked by two centre valves in two sets of four; and that for the purposes of this test I worked one set only—*i.e.*, one set of four 20-feet boxes. The constants will be as follows:—

Stalybridge	30 ft. by 20 ft. ÷ 750	= 0·800
Stretford	20 ft. by 20 ft. ÷ 1100	= 0·363

This clearly proves that the Stalybridge purifiers are not 50 per cent., but 100 per cent. larger, make for make, than the Stretford purifiers during the test. I should advise Mr. Hill next time that he is not clear on a point, to ascertain the exact facts before drawing his own conclusions, which in this matter are contrary to the facts.

The figures given by Mr. Hill and "An Old Foreman" are highly satisfactory; but as the conditions at both works are very different to many of those whose figures were quoted at the Manchester meeting, the results cannot be compared from the data supplied.

I should like to point out to "An Old Foreman" that the efficiency of a purifier depends on the velocity of the gas passing through it; and that he is comparing his results with those of engineers who are saddled with small boxes, through which the rate of flow is double that through his own boxes. Before, therefore, we can judge whether his are doing good work, we shall require to know: How many boxes he works in a cycle? Whether he changes when the second, third, or fourth box becomes foul? What coal he carbonizes? His make per ton? The type of washer in use?

In conclusion, I beg to inform "An Old Foreman" that I am one of those who do not desire to be always before the public; but if I am able to give my fellow engineers any information with regard to new processes or plant, I am prepared to "blow my own trumpet" continuously.

Stretford, March 22, 1906. H. Kendrick.

Sir,—Referring to Messrs. Cutler and Sons' letter in your issue today, and to your "Editorial Note" in reference to purification results at Berlin, *vide* p. 163 of your issue of April 19, 1904,

We regret to say that we have been unable to obtain the figures you referred to; but we think that, in the absence of these, it may interest your readers to hear that four purifiers were fitted at Dresden with "Jäger" grids and four with "Standard" grids, and that twelve more purifiers are about to be fitted with the latter.

We do not know whether the "Jäger" grids have also been further adopted at Dresden, but merely state the above fact as we observe that Messrs. Cutler state that they are confirmed in their "contention that the 'Jäger' system is superior to others."

We consider this of equal value to Messrs. Cutlers' contention in reference to "unyielding arches"—*vide* their reference to the "Standard" grids in the issue in which your editorial note appeared.

As the "Standard" grids were not much in evidence at the Manchester meeting (most of our installations being in the South), we trust you will see your way to insert this note, although, in this event, we may be accused of obtaining a "free advertisement."

March 20, 1906. Kirkham, Hulett, and Chandler, Limited.

Notes on Gas-Fires—From an Official's Standpoint.

Sir,—In the letter concerning gas-fires which you kindly inserted in last week's "Journal," I find that I represent the late Mr. Thomas Fletcher to have demonstrated that the alleged dryness of the air of a room heated by a gas-fire to be due to the presence of "this gas"—*i.e.* (by the context), carbon monoxide. This, of course, is an error. I had intended to say "products;" the *ipsissima verba* of Mr. Fletcher being "a trace of sulphur in the products of combustion escaping."

32, *Perrymead Street, S.W., March* 24, 1906. J. Arnold.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill read the third time and passed: Kidderminster Gas Bill.
Bill withdrawn: Fulwood Urban District Water Bill.

The opposition to the Accrington District Gas and Water Board Bill and the Holyhead Water Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill read the first time and referred to the Examiners: Kidderminster Gas Bill [Lords].
Bills read a second time and committed: Heacham Water Bill, Mid-Oxfordshire Gas Bill.
Bills reported, with amendments: Dowlais Gas Bill, Epsom and Ewell Gas Bill, Merthyr Tydfil Gas Bill, Thornton Urban District Gas Bill, Watford Gas Bill.
Bill withdrawn: Burry Port Gas and Improvement Bill.

The Standing Orders Committee have given permission to the Shrewsbury Corporation to deposit a petition for a Bill to enable them to construct the necessary works, and take the waters of the Cormal Brook and the River Severn for the supply of the town.

MERTHYR TYDFIL GAS BILL.

House of Commons Committee.—Monday, March 19.

Before Mr. H. J. TENNANT, *Chairman, Viscount* TURNOUR, *Mr.* HODGE, *and Mr.* VERNEY.)

Consideration of this Bill, commenced on the 15th inst. (*ante*, p. 809), was resumed to-day.

Sir RALPH LITTLER, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. MUNROE appeared for the promoters. The petitioners against the Bill were represented as follows: The Merthyr Tydfil Corporation by Mr. FREEMAN, K.C., and Mr. KNOX, K.C.; the Cardiff Corporation by Mr. ACWORTH; the Glamorgan County Council by Mr. LANKESTER, K.C.

Mr. *G. Sibbering*, the Chief Engineer to the Taff Vale Railway Company, gave evidence that they were satisfactorily supplied in all respects by the Merthyr Gas Company. His Company were ratepayers in the district, and they were strongly opposed to the transfer of the undertaking to the Municipality.

Evidence in support of the promoters' case was also given by Mr. *G. Hankey*, of Merthyr Tydfil, Mr. *R. Jenkins*, Surveyor, and Mr. *D. Prosser*.

In cross-examination by Mr. FREEMAN, the last-named witness acknowledged that if the gas were cheaper than at present, and the Corporation were able to supply the whole of the district and charge a uniform price, it would be an advantage.

Mr. FREEMAN: Have you any objection to the ratepayers being consulted on this question before next session, when a Bill could be promoted?

Witness: I am sure the ratepayers would vote against it.

Replying to the CHAIRMAN, witness added that it was his view that the Corporation would not carry on the undertaking as cheaply and efficiently as the present Company did.

Mr. *W. Burr*, a resident of Merthyr Tydfil and also a gas consumer, said he had no fault to find with the way in which the Company had carried on their undertaking. He did not think the Corporation would manage it so well.

In cross-examination by Mr. FREEMAN, witness said he considered that so long as the Company charged 2s. 10d. per 1000 cubic feet, it was reasonable. He had had no experience in the matter of a corporation managing the gas supply well.

This concluded the evidence for the promoters.

Mr. *E. W. Drew*, of the firm of Messrs. Wood, Drew, and Co., called on behalf of the Merthyr Tydfil Corporation, said he had examined the accounts of the Company, so far as he had been able to have access to the printed balance-sheets and the Board of Trade returns. On the capital account they had stated correctly the total amount of the capital issued. There was 5 per cent. preference stock which was not paid up, but was allotted to the shareholders under the Act of 1868. Then there was the ordinary 10 per cent. stock which was paid up, and the ordinary 7 per cent. stock, amounting altogether to £30,000; making a total share capital of £33,300. He believed £3300 of this was not found by the shareholders, but was a bonus issued to the original proprietors under the Act of 1868. The last issue of ordinary stock was in 1896—£5250 of ordinary 7 per cent. stock, issued at par to the shareholders. He had checked the capital expenditure for the last fifteen years. In 1890, the number of consumers, according to the Board of Trade returns, was 1350; whereas on Dec. 31, 1904, they amounted to 2750—being an increase of 1400 in the fourteen years. The number of public lamps had also about doubled. Nothing whatever had been charged to capital account during these years for meters, services, or lamps, nor for stoves on hire. The mileage of mains of the Company, as shown by the Board of Trade returns in 1890, was given as 21, and in 1904 as 34—an increase of 13 miles. But nothing had been charged to capital during these years. He had made an approximate estimate as to what he thought must have been paid out of revenue for capital purposes within the period named, and he put it roughly at £10,000. He had examined the accounts for the last two years specially with the view of seeing what was the cost of production of gas. The profit shown for the year 1905 was £3200; and to this he added the parliamentary charges, which had been placed to the revenue account, £1250. Then he added £100, being the amount transferred to the insurance fund, which was also charged against the revenue account; and he added income-tax, £285, also charged to revenue. These four items made a total of £4835. To this was to be added £100, the interest on the reserve fund, and £121 interest on moneys deposited at the bank, which gave a gross figure of £5056. He deducted the interest on the debenture stock, £219; and there was left a net profit of £4837, which was equal to 12·65d. per 1000 cubic feet of gas sold. The maximum dividend was £2611, which was equal to 6·83d. per 1000 cubic feet sold. This left a surplus of £2226, equivalent to 5·82d. per 1000 cubic feet sold. It would therefore have been possible to reduce the charge for gas by this amount, and still pay maximum dividends. Witness proceeded to go through figures showing the sums the Company had put aside out of profits beyond what he considered they ought to have done. The amount of the carry-over on Dec. 31, 1905, after allowing for the dividend to this date, was £13,892. In 1890, it was £4508; and in 1900, £9412. For the last six years, about £800 a year had been added out of profits to the carry-over; and this on the present sale of gas would be rather more than 2d. per 1000 cubic feet. Accumulations of profit were largely represented by cash at bank.

In cross-examination by Mr. LLOYD, witness said that 1903, 1904, and 1905 were very similar years in regard to the prices for coal and the amounts realized for residuals; and three years prior to this they had been better. If they took three years farther still, they were about the same as they had been during the last triennial period. He had heard it said by the witnesses for the Company that they could supply gas from 1d. to 2d. per 1000 feet cheaper than they had done. This would make it just agree with him, and get rid of the £800.

Mr. *W. A. Valon*, examined by Mr. FREEMAN, said he was well acquainted with the Merthyr district, and had recently visited it on several occasions for the purpose of the present inquiry. The works of the Company were in excellent repair, and there was a considerable surplus manufacturing plant—about 60 per cent. The gas storage was restricted; and he agreed that it would be a proper thing to have further gasholder room as a matter of permanent economy. Having regard to the facts, the proposed new capital of £80,000 appeared to him altogether more than his experience would suggest. He had never heard of working capital being raised for this particular purpose in addition to that wanted for extensions. Whatever the borrowed capital was, he thought it ought to be subject to the auction clauses. The stock now had been issued to the shareholders at 5 per cent., which was a very high rate. There was no doubt the Company were entitled to a reserve fund. The only remark he had to make about it was that it should be confined to the paid-up capital, and not to the converted capital. As to the undivided profits being brought forward, he would object to any such sum being carried over as was sufficient to pay five years' dividends; it was not necessary. By properly adjusting the accounts, a reduction in the price from 2s. 10d. could be made. He thought it would be for the public advantage that the gas supply of the district should be in the hands of one body. Apart from any question of whether it was better in the hands of a corporation than in those of a company, if this district was to be supplied properly and economically, it could only be done by the Corporation.

Mr. FREEMAN: Have you ever known a case where, owing to so many gas companies supplying in one district, purchase was more desirable?

Witness: No; I think there cannot be any doubt at all that it would be almost a calamity to this district if the supply of gas did not pass into the hands of the Corporation, because without it it is quite impossible for the companies to agree among themselves, and the price of gas in some parts of the district must be maintained at a very high figure.

You have had experience, have you not, where companies have had Bills asking for powers, and the corporation have asked for a prospective clause to be put in with regard to purchase?—Yes; there have been several cases of the kind.

There have been various instances where, companies having come for powers, the corporation have asked for a similar clause allowing for purchase in the future; and in the course of the inquiry, for some reason or other, the company have agreed to it?—Yes; there is no end of cases of the kind, where a company when in the House have agreed. They fail to agree before; but when they come to Parliament they agree.

Do you see the slightest hardship in the Merthyr Company having a clause in their Bill to say that if the Corporation promote a Bill next session to purchase them, and they are purchased, they shall not be entitled to bring into their claim any benefit arising from any of the powers now given to them for the first time?—No; and in the case of non-statutory companies that is generally the clause. I do not see the slightest hardship in such a clause going in.

That is to say, if the Corporation choose to exercise the right of coming to Parliament and asking to buy the Company, and do buy them, then they are to be bought as if they had been bought to-day?—Yes; I think the great reason for this is that, however desirous the Corporation may have been to have brought in a Bill, obviously it is impossible, because they did not know the Company were coming.

In cross-examination by Mr. LLOYD, witness said that where non-statutory companies came to Parliament they were very often put under such terms as he had suggested; but he was not prepared to argue that Parliament had never done this in the case of statutory companies except in a limited sense—that was, where purchase had been inserted in Bills not always brought about directly, but by pressure of some kind. He had no objection to the conversion of the capital; but he thought the reserve and other funds should be reckoned on the paid-up capital.

Replying to Viscount TURNOUR, witness said he thought it would certainly be possible, supposing the Corporation had power to take over the Merthyr Company, to supply gas at a cheaper rate without loss to the ratepayers.

Mr. *Charles Hunt* agreed generally with the evidence of the previous witness. As to the standard price, he thought it ought to be half-a-crown, having regard to the profit which had been made in the past.

Under the special circumstances of the case, he said there could be no question that it was very desirable that the whole of the supply of Merthyr should be in one hand.

Mr. KNOX: And if there is ever to be any transfer, do you consider this a favourable time for it to take place?

Witness: Certainly, having regard to the fact that the Company are at the end of their tether, and that new works will be required for the district.

And do you think it would be possible to manufacture gas more cheaply for the whole district on this new site than it can ever be supplied for in any other way?—Yes; I think so.

In cross-examination by Mr. LLOYD, witness said he was not specially an advocate of purchase, but he was in this case, because it seemed to him the only way the new supply could be got into one hand.

Mr. *E. Morrell*, the Mayor of Merthyr Tydfil, stated that at the last borough election those who advocated the municipalization of water, gas, and electricity were returned at the head of the poll. He was in favour of the acquisition of the undertaking of the Gas Company by the Corporation.

Tuesday, March 20.

On the resumption of the proceedings this morning,

The CHAIRMAN said he understood that all Mr. Freeman was arguing for now was that the Committee should not prejudge purchase by the way proposed in the Bill.

Mr. FREEMAN said the form of the clause which was usually drawn up was very much to this effect—that if during the next session of Parliament the Corporation brought in a Bill to purchase the undertaking, the Company should not oppose on principle but only on details if they liked, and that nothing given in this Bill should be brought in as an asset when the compensation had been assessed.

The CHAIRMAN: Supposing the Committee were to insert a clause to the effect that they do not wish to do anything in this Bill which will appreciate the assets of the Company, yet at the same time do not want to prejudge the case either one way or the other with regard to it, would not that be a possible thing to do?

Mr. FREEMAN: Quite possible.

The CHAIRMAN: Would it be accepted by the promoters of the Bill if the Committee were to insert a clause which should say that if the Bill should pass into law the price or consideration to be paid by the Corporation in the event of their proving their title should not be enhanced by the passing of this Bill, and further that nothing in the Act should prejudge or prejudice the question of purchase or no purchase later on.

Mr. LLOYD expressed dissent from any such clause, because, as a matter of fact, whatever words were put into a clause with the view of removing prejudice, that prejudice always remained.

Sir R. LITTLER pointed out that a future Committee might be prejudiced. A clause of the kind would inevitably result in any money proposed to be raised being raised on worse terms.

The CHAIRMAN thought it ought to be quite possible for an experienced draftsman to prepare a clause such as would not prejudice the minds of any future Committee.

Sir R. LITTLER suggested words to the effect that the passing of the Bill should neither appreciate nor depreciate the price to be paid by the Local Authority if a Bill should pass through Parliament in the next session. The promoters thought it only reasonable that they should ask for this, because they could not go on spending capital if it was to be uncertain whether or not it was to be a permanent investment. The Committee did not say anything about a time-limit; and the promoters thought this should be the next session. They desired to add a proviso that if, in the opinion of the arbitrator, the capital was properly expended in the meantime, it should be repaid, with reasonable interest.

Mr. FREEMAN expressed agreement with the learned Counsel's last remarks.

The CHAIRMAN: You both mean the same thing; and may I say that you not only mean it but say it? If you can come to a compromise as to the amount of capital and the standard price, we shall be glad.

Sir R. LITTLER proposed that 2s. 10d. should be agreed to as the standard price, though he believed the result would be that the Company would have to come to Parliament earlier than they otherwise would. He said he would be prepared alter the £80,000 capital in all to £60,000, which would be £45,000 of share and £15,000 of loan capital. The standard should not be lower than the actual price charged. A standard price was absolutely different from a maximum. They were proposing by this Bill to deprive themselves of the right to charge the 3s. 2d. which they now charged, and to bring it down to the lowest price.

Mr. FREEMAN thought the capital of even £60,000 was more than the Company would want within a reasonable time; but, as an all-round settlement of the matter, he would be prepared, if the promoters would meet him on the question of the standard price, to concede the £45,000 and £15,000. With regard to the price, the Company's own Manager had said that they could supply gas at 1½d. or 2d. per 1000 cubic feet less than now. Therefore, on their own showing, there ought to be a reduction below 2s. 10d. He would accept 2s. 8d., and give them capital to the amount of £60,000.

The CHAIRMAN: Won't you go a small inch towards each other, and make it 2s. 9d. (Laughter.) It is the principle of arbitration to split the difference, isn't it?

Counsel assented to the Chairman's suggestion.

It was agreed that clauses should be brought up next day.

Thursday, March 22.

To-day the following clause was brought up, and ordered to be inserted in the Bill:—

If the Mayor, Aldermen, and Burgesses of the Borough of Merthyr Tydfil shall introduce a Bill into Parliament in the next session for an Act to empower them to purchase the undertaking of the Company, nothing in this Act contained shall be deemed to prejudge or prejudice one way or the other the question of such purchase. In the event of such Bill becoming law, the value of the undertaking shall not be enhanced or depreciated by the passing of this Act, or by anything herein contained; and, in addition to such value, the Company shall be repaid all moneys in excess of twelve hundred pounds (if any) which the arbitrator, arbitrators, or umpire who determine or determines such value may deem to have been reasonably expended by the Company in obtaining this Act and for capital purposes, and in acquiring the said lands and easements, and erecting a gasholder and other necessary works in connection therewith. But the Company shall not issue capital or borrow, save for the purposes aforesaid, before the 1st day of December, 1906; and if the said Mayor, Aldermen, and Burgesses shall previously have given notice of, and introduced and *bonâ fide* promoted, such Bill, then during the promotion of such Bill.

The clause dealing with the sliding-scale was amended so as to bring it into operation on July 1, 1907, instead of Dec. 1, 1906.

DOWLAIS GAS BILL.

House of Commons Committee.—Tuesday, March 20.

(*Before Mr.* H. J. TENNANT, *Chairman, Viscount* TURNOUR, *Mr.* HODGE, *and Mr.* VERNEY.)

This Bill, by which power is sought for the dissolution of the Dowlais Gas and Coke Company, Limited, and its re-incorporation with additional money and other powers, including permission to apply for a Provisional Order to supply electrical energy, came under the consideration of the Committee to-day.

Mr. MOON, K.C., and Mr. CLEASE appeared for the promoters; Mr. FREEMAN, K.C., and Mr. KNOX represented the Merthyr Tydfil Corporation, who petitioned against the Bill, mainly on the ground that if the supply were put into their hands the consumers would benefit, as there would be no dividend to pay.

Mr. MOON, in opening the case, after giving particulars as to the area and population of the district, and pointing out that the Company were asking for parliamentary powers for the first time, said that in recent years they had been very successful, and had been paying dividends of from 12 to 15 per cent. Up to 1891, the amount of capital issued to the shareholders was £17,000; but after that year it became necessary to incur certain expenditure from time to time; and various sums had been spent out of revenue on capital account. The total amount was about £5000; and, of course, to this the shareholders were entitled. In 1904, there was a great desire in Dowlais to have an increased supply of gas; and the Company, being willing to give it, largely extended their works, and were involved in liability to the amount of £10,000 in respect of these extensions. The works were determined upon, and carried out, before the question of coming to Parliament took shape. They obtained the £10,000 by borrowing from the bank in the first instance, and by the appropriation of the sums they had spent out of revenue. In the course of the present year, in order to put themselves on a proper financial footing, they created new shares, to the amount of £10,000, to pay for the works they had carried out; and they issued this stock to the shareholders at a discount of 25 per cent. Having to face the large expenditure of £10,000, involving the reconstruction of a considerable part of the works, the Company came to the conclusion that the time had arrived when they ought to ask for statutory powers. One of the considerations that influenced them in this was that, there being an Electric Light Company under a Provisional Order extending to Dowlais, this Company were rumoured to be about to enter into a more forward policy of competition with the Gas Company. The Merthyr Electric Light and Traction Company had a Provisional Order for lighting and traction. They ran into Dowlais, and had lighted the tramway route; but they had done nothing in the way of any general competition with the Gas Company, and nothing in the way of general cabling of the streets for the purpose of supplying electric light to the consumers along the route. The actual price of gas was 3s. 6d. per 1000 cubic feet now, and some years ago it was 3s. 9d. It had been as high as 4s., owing to the enhanced price of coal. Their opponents said 3s. 6d. should be fixed as the standard price. The figure given in the Bill was 4s. 6d.; but the advisers of the Company had considered the matter carefully, and had come to the conclusion that 4s. or thereabouts was the right price to fix as the standard. The total capital they proposed should be £64,000, of which £54,000 should be original, and £10,000 in order to meet future capital charges. Upon the £54,000, they asked for a dividend of 5 per cent.

The CHAIRMAN: Does the Company stand in the same position as Merthyr in regard to purchase?

Mr. KNOX: No; this is a non-statutory Company. The practice has been for years past that when such a company comes to Parliament asking for a clause to be put in which provides that, in the event of the local authority purchasing within the next two or three years, the company shall not oppose the Bill except on details.

Mr. MOON: That is the general practice.

The CHAIRMAN: I should have thought you could have arrived at some agreement.

Mr. MOON: The latest precedent is that of last year, in the case of Hitchin; and I am prepared to accept that clause.

The CHAIRMAN: Was that a peculiar case?

Mr. KNOX said it was, because by it there was an absolute direction to the Arbitrator to give 10 per cent. He was not prepared to accept that.

The CHAIRMAN: Why cannot you leave it to the arbitrator?

Mr. MOON: I am quite content to take 10 per cent. instead of the arbitrator giving us 50 per cent., which he might do. (Laughter.)

The CHAIRMAN: Will the purchase clause affect the promoters as to the amount of money they want to raise.

Mr. MOON: No; if we are purchased the question of capital does not matter, because we shall not want to raise any. But we are obliged

to take power to raise the money because the Local Authority's Bill might fail.

Evidence for the promoters was then given by Mr. *T. B. Hurst*, the Vice-Chairman of the Company; Mr. *I. Edwards*, an Auctioneer and Estate Agent; Mr. *Calcraft*, the Secretary of the Dowlais Chamber of Trade; Mr. *W. M. Davis*, a resident of Dowlais; Mr. *D. Jones*, the Manager of the Dowlais Gas-Works; and Mr. *E. Herbert Stevenson*.

Wednesday, March 21.

When the proceedings were resumed this morning,

The CHAIRMAN said he hoped the parties had arrived at some kind of concordat.

Mr. KNOX: I understand the Company are willing to take a purchase clause in the Hitchin form, which contains a provision making it an absolute direction to the arbitrator to allow 10 per cent.

Mr. CLEASE (for the promoters): We are prepared to accept the Hitchin clause without the 10 per cent. if we can get our capital on this basis—£34,000, which is doubling the £17,000, and £10,000 on that; making £44,000.

Mr. KNOX: The practical point between us is the amount of £2500; and we do not feel that we are justified in allowing this to be charged against the consumers for ever.

The CHAIRMAN: I think it would not be a very unfair thing if, Mr. Cleese having withdrawn the operative part of the Hitchin clause—the 10 per cent.—you could see your way to come to an agreement upon the £2500 in dispute, and make it £1250.

After a brief private consultation,

Mr. CLEASE announced that the Chairman's suggestion had been adopted. This would entail various amendments in the Bill, because it was obvious that capital issued this year must rank *pari passu* with that issued before.

Mr. KNOX said that, in accepting the suggestion, the Committee would understand that he did so in deference to the views of the Committee to save time, without at all admitting in any future proceedings that this amount had been actually spent out of capital.

Mr. CLEASE: The only point left is the question of the standard price. We have suggested 4s.

Mr. *E. H. Stevenson*, who had given evidence for the promoters the previous day, said there must be a standard price; and he thought it should be 3s. 8d.

Mr. CLEASE: On our expert advice, we have come down to 3s. 8d.

The CHAIRMAN: What do you say to that, Mr. Knox?

Mr. KNOX said the present average price was 3s. 3½d.

In cross-examination by Mr. KNOX, Mr. Stevenson said he could not see his way to saving a halfpenny, notwithstanding all the capital expenditure.

Mr. KNOX: Is not the effect of your evidence that, if the Company had gone on without coming for statutory powers, they would have had difficulty in maintaining the dividend of 10 per cent. and 5 per cent. on the new capital?

Witness: I do not say that at all, because the Company would just charge what they required to make their dividend.

The CHAIRMAN suggested that 3s. 6d. might be considered a fair and reasonable standard price.

This was agreed to by Counsel.

The CHAIRMAN pointed out that, whatever they settled before the Committee to-day, did not affect the arbitration in any way.

This concluded the case; and the clauses were brought up, adjusted, and passed the following day (Thursday).

WOLSTANTON URBAN DISTRICT COUNCIL GAS BILL.

House of Lords Committee.—Friday, March 23.

(*Before Earl* CAWDOR, *Chairman, Viscount* HILL, *Lord* ELLENBOROUGH, *Lord* ABINGER, *and Lord* NORTHBOURNE)

This was a Bill by which the Wolstanton Urban District Council sought authority to acquire the undertaking of the Chesterton Gas Company, and to carry out certain projects.

Mr. HONORATUS LLOYD, K.C., and Mr. C. C. HUTCHINSON appeared for the promoters. Mr. READER HARRIS, K.C., represented the Stafford County Council; Mr. WEDDERBURN, K.C., and Mr. KEEN, the Newcastle-under-Lyme Corporation; and the Hon. J. D. FITZGERALD, K.C., and Mr. CLEASE, the Burslem Corporation.

Mr. HONORATUS LLOYD, in opening the case for the promoters, said the Urban District of Wolstanton was formed in April, 1904. It included three parishes—Wolstanton, Silverdale, and Chesterton—the population of which was 22,645, the rateable value £92,962, and outstanding loans £16,366. Adjoining this district were the areas of two Corporations—Burslem and Ashton-under-Lyne. Prior to 1887, there were Gas Companies in existence which supplied the areas of these two Corporations, and also the parishes of the district with which he was dealing. In 1877, these Corporations, which were then Local Boards, came to Parliament with a view of obtaining power to supply themselves with gas, just as he was seeking that day; and inasmuch as there were three Companies existing and supplying their districts, it was part of their schemes that they should acquire the undertakings of those Companies. A good deal turned upon these two Acts, which provided that the township of Wolstanton should be included, but provided always that nothing contained in the section should prejudice any application by any sanitary authority, formed or to be formed, to include the township of Wolstanton to supply themselves with gas. The section continued that, if such powers were granted, the Corporation "shall sell, and such other sanitary authority shall purchase, all mains, pipes, and other works" at a price to be fixed. Therefore the position was this: His district had recently been formed; and it was at present partly supplied with gas by the Burslem Corporation and partly by the Newcastle-under-Lyme Corporation, as successors of the Company whom they bought up. They purchased the Company on the parliamentary provision that, if his Local Authority was formed, he should have the right to call upon them to sell their mains, pipes, and fittings to him. This was exactly what he wanted to do. Wolstanton was supplied partly by Burslem and partly by Newcastle; his district of Silverdale was supplied by Newcastle; and Chesterton was supplied by a Company. At the latter place, there was no public lighting whatever. The public lighting had been a matter of agitation for some years; and the moment his district became an urban district, the matter was taken up very seriously indeed. They had agreed with the Company, who at present gave them a partial supply in Chesterton, to buy their works by consent for the sum of £2600; and they asked that this agreement might be confirmed. In the next place, they wished to be enabled to carry out the purchase of the mains, pipes, and fittings of the Burslem Corporation in the promoters' district; thirdly, to deal similarly with the Newcastle Corporation; fourthly, the Bill was to enable them to borrow money for the purpose of enlarging the works in order to supply their whole district; fifthly, to fix the maximum price under which they shall trade; and, sixthly, to regulate the quality and pressure of the gas. As to the agreed purchase, they had been advised that it was a fair price to pay for the Company's undertaking. The site of the works was admirably adapted for supplying the whole district. If Wolstanton were authorized to carry on their own gas undertaking, the result would be that they would have one price for gas throughout their district. At present, they had three different prices. At Chesterton the Company charged 4s. per 1000 cubic feet, with a discount of 2d.; Burslem, 2s. 8d., with a discount of 2d.; and Newcastle, 3s. 6d., with a 6d. discount until July last, when it was reduced to 3s. 4d., with a discount of 6d. They did not regard this as satisfactory. As to the purchase of the mains, pipes, and fittings of the two Corporations, he was asking by this Bill to carry out what these Corporations were liable to under the parliamentary condition. The maximum price they asked for was 4s. per 1000 cubic feet, which was the same as the adjoining Corporations. Although they asked this as a maximum, they did not anticipate that they would have to charge 4s. As to quality and pressure, they had adopted the model clauses, and consequently what was now almost universal—14-candle power gas. Then they asked to be allowed to borrow £2600, the agreed sum for the Chesterton undertaking; such sum as may be necessary for the mains, pipes, and fittings of the Corporations; £25,000 in order to extend and improve the works; £2000 for working capital; and the amount necessary to pay the cost of the Act. In their petition, the Burslem Corporation took up this extraordinary position: Although Parliament provided in these Acts that they should be enabled to purchase their mains, pipes, and fittings, that Parliament intended, notwithstanding this fact, that they should remain the gas undertakers in the district, and should be entitled to supply. In other words, although they were to pay the Burslem Corporation for their mains, pipes, and fittings in the Wolstanton district, the Corporation were still to be at liberty to lay fresh mains, pipes, and fittings alongside them, and to compete in that district. Such a suggestion was ludicrous. In their petition, Burslem had substituted for the words "mains, pipes, and fittings," the words "portion of their undertaking." This was most misleading; and he could not help thinking that they were put there for a purpose.

Mr. CLEASE: Do I understand that my friend argues that the mains, pipes, and fittings are not a part of the undertaking?

Mr. LLOYD said if his friend was willing to admit that the word meant "mains, pipes, and fittings," he would let the discussion drop. The object of the petition was an invitation to the Committee to cut out what Parliament had given them in the Acts he had referred to, and make them buy as a going concern. The petition of the Newcastle-under-Lyme Corporation was very similar; but they put it in stronger and more unjustifiable language. This was as clear a case as could be of ascertaining the price of the mains, pipes, and works *in situ* as capable of earning profit.

Mr. *Edward Hollingshead*, the Clerk to the Wolstanton Urban District Council, then gave evidence.

Mr. *Corbet Woodall* said that, after examining into the whole of the circumstances, he advised the Council to buy the undertaking of the Company. There was no public lighting at Chesterton. It was clearly necessary that there should be public lighting; and in this case he thought it was advisable that the public authority should do it. It was clear that they had the right to purchase the mains, pipes, and fittings; and he was of opinion that there was a distinction between the word "undertaking" and "mains, pipes, and fittings." "Undertaking" would mean valuing it as a going concern; but "mains, pipes, and fittings" would be *in situ* as capable of earning profit. In his experience, 4s. per 1000 cubic feet was a reasonable price as a maximum. It was rather high; but the maximum was not of any importance, because, if they started raising the price of gas, they would lay themselves open to the competition of electricity. As to the candle power, they had adopted the model clause, and 14-candle power was that which was now generally used. They asked for £25,000 in order to improve and extend the works, and to deal with present and future consumption. They would also want the money to pay for the undertaking of the Company, and a small sum for working capital.

Mr. WEDDERBURN: If you are asking for an additional advantage to our disadvantage, do you agree we should have compensation?

Witness replied that that might be so ordinarily; but here the promoters were asking for what was contemplated in existing Acts.

In reply to Mr. LLOYD, witness agreed that the two Corporations had known since 1877 that they had a precarious holding in the district; and, knowing they had a sort of leasehold, they should have provided for it. Wolstanton had contributed to the paying of the interest and sinking fund in respect of these works, and had reduced the rates of the Corporations.

Mr. *E. H. Stevenson* said it was his view that the supply of the whole district should be in one hand. The capital asked for was sufficient; and the maximum price was a very fair one. There was no injustice in taking this over from the other Corporations, and by the sections in the Acts of these bodies it was the fact that, if the promoters bought the mains, pipes, and fittings, and then the Corporations laid others down, the promoters would have to buy such further pipes if the Corporations were left with their powers of supply in the district. It

would be a vicious circle. The price of gas would not be increased in Newcastle, for the surplus now went to the relief of rates.

Mr. WEDDERBURN: Then you are injuring us?

Witness: No; it is an immoral thing that a Corporation should make money out of gas.

Mr. *W. Bolton*, the Chairman of the Highways Committee of the Wolstanton Urban District Council, also gave evidence.

Mr. FITZGERALD then addressed the Committee on behalf of Burslem. He said that, but for the Act of 1877, this would be a Bill for which there was no precedent at all. The inevitable result of taking away a portion of the district would be that the price of gas would be increased both in Wolstanton and Burslem. The price varied with the size of the concern; the larger the undertaking, the cheaper the gas. The management expenses of Burslem would remain the same, the size of their works would remain the same, but suddenly their output would be reduced by 13 or 14 per cent.

Mr. *Henry Peaty*, Manager of the Burslem Corporation Gas-Works, Mr. *Edmund Leigh*, a resident at Wolstanton, and Mr. *Albert Brooke*, also of Wolstanton, having given evidence, the Committee adjourned till yesterday (Monday).

UNOPPOSED BILLS.

Last Tuesday, Lord ONSLOW, the Lord Chairman of Committees, dealt with several Unopposed Bills, among them being the

Mirfield Gas Bill.

This Bill is to confer further powers upon the Mirfield Gas Company, including the raising of additional capital to the amount of £90,000, with borrowing powers, and the reduction of the illuminating power of the gas from 16 to 15 candles. By clause 49 of the Bill, the Company seek authority to supply gas for power purposes; and originally it contained the following provision:

> Provided that the Company shall not be bound to supply gas to be used for power purposes to engines attached to private power or suction-gas plants under any such contract as hereinbefore mentioned, unless and for such period only as such supply can be given without interfering with the supply of gas for public or private lighting purposes, or for use for power purposes by consumers whose engines have no connection with any such private power or suction-gas plant.

On the suggestion of the Chairman's Counsel (Mr. Albert Gray) this provision was amended as follows:—

> The Company shall not be bound to supply gas to be used for power purposes to engines attached to private power or suction-gas plants except after 24 hours' notice from the consumer on each occasion when such supply is demanded, and except for such period only as such supply can be given without interfering with the supply of gas for public or private lighting purposes, or for use for power purposes by consumers whose engines have no connection with any such private power or suction-gas plant.

Evidence having been given as to the statements in the preamble, the Bill was ordered to be reported.

The Unopposed Bill Committee of the House of Commons, presided over by Mr. ALFRED EMMOTT (Chairman of Committees), on Friday had under consideration several unopposed measures. They first dealt with the

Carlisle Corporation Bill.

It having been explained that the object of the Bill was to empower the Corporation of Carlisle to acquire additional lands for their Geltsdale water scheme, to extend the time for the completion of the works, to authorize the borrowing of further moneys in respect of their gas and water undertakings, and for other purposes,

Mr. *A. H. Collingwood* (Town Clerk) and Mr. *E. L. Mansergh* (Water Engineer) gave formal evidence.

Mr. SOUTTAR (representing the Agents) said the Corporation had completed nearly the whole of the works, excepting the storage reservoir; and now they required further capital, amounting altogether to £98,500, and also £1500 for the purchase of land for the protection of the reservoir. It was not the fault of the Corporation that they required all this additional money; it being due to an under-estimate on the part of the Engineer who preceded Mr. Mansergh, as to the cost of the works. The money had not been wasted; it was merely a question of the estimates being totally inadequate. In fact, after the passing of their Act in 1898, the Corporation considered the advisability of abandoning the scheme; but they had gone so far in their negotiations for the purchase of land that they decided to proceed.

The CHAIRMAN remarked that the difference was as much as 50 per cent., and that the House had taken a serious view of a case like this last year. He thought the Committee would have to give a period of 60 years for the land, but only 50 years for the works.

Mr. SOUTTAR thought this was rather hard on the Corporation, considering that the extra outlay required was not their fault.

The Committee, however, adhered to their decision, and adjourned the matter for a week in order that clauses might be prepared to provide for the period being only 50 years in the case of the works.

Thornton Urban District Gas Bill.

The Committee next considered this Bill, which is to empower the District Council to supply gas, and to provide for the transfer to them of such portion of the gas undertaking and plant of the Poulton-le-Fylde Urban District Council as is within the Thornton district.

Sir CHANDOS LEIGH (the Speaker's Counsel) remarked that the standard price of gas was 4s. 6d. per 1000 cubic feet. He suggested that in the case of prepayment meter supplies the meter-rent, without fittings, should be 5d.

The AGENT said the district was a poor one, and he thought the 6d. mentioned in the prepayment clauses was little enough.

The Committee agreed to this figure.

Watford Gas Bill.

This Bill came next. It provides for the conversion of the existing stock of the Watford Gas Company, confers power to raise additional capital, and authorizes the extension of the works.

Sir CHANDOS LEIGH said the promoters were adopting Sir George Livesey's sliding-scale, and they were asking for a reduction from 15 to 13 candles in the illuminating power of the gas.

Mr. *H. E. Jones* pointed out that incandescent burners were on the increase. He said that about 90 per cent. of their consumers now used the Welsbach burner, and this was encouraged by the fact that the Company always attended to the replacement of the burners by their own men.

Sir CHANDOS LEIGH: What are you supplying gas at now?

Witness: At a very low price—2s. 10d. per 1000 cubic feet. That is also a practical example of Sir George Livesey's sliding-scale, because we have gradually worked down the price of gas until it is now conspicuously low. Nine-tenths of any saving we make naturally goes to the consumer.

The CHAIRMAN: It is rather a large order to reduce your illuminating power by 2 candles and not alter your maximum charge.

Witness admitted that it was rather a large one. He thought it would be best to deal with the matter by making a reduction of 1d. per 1000 cubic feet.

Sir CHANDOS LEIGH suggested that the standard price should be 4s., instead of 4s. 3d.

Witness replied that this would be rather hard upon the Company. The price of their stock in Watford was about £240 for £100, and five-sixths of their capital did not earn more than 5½ per cent. Now, with their consolidation, it would be nominally 5 per cent.

The CHAIRMAN: I think the standard will have to be 4s. 1d.

Witness said he hoped the Committee would not make it too stiff upon the Company. In the West Ham case, only 1d. per 1000 cubic feet was put upon them for 2 candles reduction. If the Committee made the standard 4s. 1d., it would be a stiffer measure than would be dealt out to those who were nearer London.

The Committee decided that the price should be 4s. 1d.; and the Bill, as amended, was ordered to be reported.

BILLS AND ORDERS OF THE SESSION.

The Board of Trade report on the applications for Gas, Electric Lighting, &c., and Water Bills and Provisional Orders for the present session has been issued. It shows that the number of Bills relating to the supply of gas is 29 (exclusive of four classed among Electricity Bills and three among Water Bills), all, with one exception, relating to England and Wales. The capital proposed to be raised is £3,275,015—£2,366,000 by shares and £909,015 by loans. The total includes £15,000 proposed to be authorized by a Bill classed under Water Bills and £107,666 by three classed among the Electricity Bills; but excluding £107,666 proposed to be authorized for purposes connected with the supply both of gas and electricity by three Bills classed among Electricity Bills. There are 28 Bills relating to the supply of electricity for England and Wales. The amount of capital proposed is £18,107,665—£13,877,000 by shares and £4,230,665 by loans; but in seventeen cases the capital is not stated. There are 17 Bills relating to the supply of water, all being for England and Wales. In addition to these, there are two classed among Gas Bills. The proposed capital is £1,708,963—£502,000 by shares and £1,206,963 by loans. Provisional Orders to the number of 23 have been applied for in respect of gas and water supply, and 55 in regard to electric light schemes. The capital proposed to be raised under these Orders is: Gas, £232,164; water, £262,498 (making together £494,662); and electric lighting, £593,990. Compared with last year, the capital required for gas purposes by Bills is £2,332,327 more, for water supply £1,537,142 less, and for electric lighting, &c., £8,680,667 more. For Gas and Water Orders, the capital is £114,240 more, and for Electric Lighting Orders £189,047 less.

RAILWAY COMPANIES' POWERS TO OBTAIN WATER.

The Consulting Engineer to the Sutton District Water Company (Mr. W. Vaux Graham, M.Inst.C.E.) has been calling attention in the Press to a matter of considerable importance to the county of Surrey, and especially to the Company for whom he acts professionally. It appears that, owing to a dispute with the Metropolitan Water Board on a question of charge, the London, Brighton, and South Coast Railway Company have decided to provide themselves with a supply of water, and are now sinking a well on their land adjoining the railway near the Carshalton springs of the River Wandle, with the intention of conveying the water thus obtained along the line for use at the Victoria Terminus—supplying also their stations, carriage-cleaning yards, and, it is rumoured, the new electric power station between the two places. A very large quantity of water will necessarily be required, and the site of the boring has been well chosen for obtaining it; but Mr. Vaux Graham thinks there can be no doubt, if the proposal is carried out, that the effect upon the Wandle will be disastrous. He points out that on several occasions it has been proposed to obtain water from the neighbourhood in question for the use of the Metropolis; but the proposals have always been rejected by Parliament or defeated by the opposition of interested parties in the locality. In the present case, the Railway Company are acting without any express authority from Parliament; indeed, they have not to ask permission of anyone. They will obtain the water on their own land, and will convey it along their own railway.

In order to prevent the Railway Company, if possible, from carrying out their scheme, the Sutton Water Company are promoting a Bill to ensure the preservation of their sources of supply; and we learn that it is receiving the support of all the public authorities, millowners,

and others in the locality affected. The measure is only a short one; but, if passed, it will be quite long enough to effect its purpose. The preamble sets forth that the Company are the sole authority for the supply of water within their area, and are under statutory obligation to make it adequate. The population is growing at a rapid rate, and the consumption of water is necessarily increasing. At the same time, for the purpose of protecting the springs and watercourses, and of restricting the diversion of water therefrom, the Company are prohibited from sinking any more wells. It is therefore urged that the existing sources of water should be preserved, and provision made against the "depletion and the abstraction and conveyance for sale or use beyond the area of supply of the waters which form such existing sources;" and the authority of Parliament is sought to effect the objects stated. This is done by the third clause of the Bill, as follows:—

> From and after the passing of this Act, it shall not be lawful (notwithstanding anything contained in any existing Act of Parliament) for any company, body, or person to sink any new, or deepen any existing, well, or to drive any new, or extend or enlarge any existing, adit, or to establish any new pumping-station, within the area of supply, for the purpose of obtaining or to obtain therefrom water for sale or use beyond the area of supply, without the express authority of Parliament being first in that behalf specifically obtained.

Provision is made for securing to a landowner any right he may have to supply with water any part of his estate within the Company's area, and to construct works for the purpose; and it is specified that the word "existing" in the section means existing on Jan. 1 last.

We shall watch with considerable interest the progress of this small, but most important, Bill.

ENLARGING LOCAL AUTHORITIES' POWERS.

A Bill to enlarge the powers of local authorities in respect of the purchase of land, the building of houses, and the acquisition or establishment of trading undertakings has been introduced by Mr. Chiozza Money, the member for North Paddington, and it is backed by Sir Charles Dilke, Mr. Alden, Mr. Gooch, and Mr. Arthur Henderson. It is very short, consisting of only seven clauses; but its scope is very wide. It will give a local authority, acting alone or in conjunction with others, power to purchase any site, with or without buildings or other erections or improvements, within or beyond their administrative area, from any owner willing to sell the same, at such price as may be agreed upon; to build dwelling-houses, or carry out any other constructive work, upon land which is publicly owned; and to purchase at an agreed price, from any owner willing to sell the same, or establish and carry on, any trade, business, or industry whatever, save and except the manufacture or sale of intoxicating drink. A local authority are not to sell to any but another authority any land, buildings, or business undertaking acquired, purchased, or established under the powers conferred by the Act. Any rents, interest, or profits accruing to a local authority from land, buildings, premises, or undertakings acquired or established under the powers conferred by the Act, are to be allocated to the repayment of any capital borrowed for the purposes of the Act until it is entirely repaid. Thereafter, any such rents, interest, or profits may be applied to any of the purposes of the Act.

LEGAL INTELLIGENCE.

EVESON COAL AND COKE COMPANY, LIMITED, v. GRASSMOOR COLLIERY COMPANY.

At the Birmingham Assizes, last Wednesday, before Mr. Justice Ridley, a settlement was announced in the litigation between the Eveson Coal and Coke Company, Limited, *v.* the Grassmoor Colliery Company. The plaintiffs, as recorded at the time, were unsuccessful at the first trial, last summer (see "JOURNAL," Vol. XCI., p. 387), but subsequently the Court of Appeal ordered a new trial (*ante*, p. 361).

Mr. STANGER, K.C., M.P., for the defendants, said the action arose out of certain misconduct on the part of one Cash who was formerly a Director of the plaintiff Company, and who was bound by a contract to devote his whole time to his employers. He broke this contract, and was an unfaithful servant. The action raised the question as to whether the loss occasioned by the breach of contract should be borne by the defendants, or part of it. There was a barrier to the action being settled, because the defendants conceived that the action implied some reproach on their firm. They admitted doing business with Cash, who carried on business ostensibly in the name of his son. The defendants had always been willing to meet the plaintiffs in a reasonable manner, but for that difficulty which, until recently, was thought to exist. There was no imputation against defendants; and, this being so, they would make such payment as was reasonable.

Mr. HUGO YOUNG, K.C., for the plaintiffs, said they did not accuse anyone in connection with the Grassmoor Company of anything in the nature of dishonesty. On the occasion of the last trial, his clients lost, and applied for a new trial, which was granted. They came there that day prepared to enter into the matter again, but settled it, because they had been met liberally by the defendants. It was a victory for the plaintiffs.

LIABILITY FOR THE BURSTING OF A WATER-MAIN.

In the Chancery Division of the High Court of Justice, on Monday last week, Mr. Justice Farwell gave judgment in a case which had occupied him for several days. The question at issue was as to who was responsible for the mischief caused by the bursting of a water-main belonging to the London Hydraulic Power Company in Piccadilly Circus on the 10th of July last. The St. James's and Pall Mall Electric Light Company, the defendants in the action, were alleged to have caused the accident by constructing an inspection chamber or manhole so that it rested on the pipe, and transmitted to it the vibration caused by traffic above. Though the amount actually claimed by the plaintiffs was less than £200, a declaration was asked for which would affect other liabilities to a very considerable amount. The pipe in question was in position in 1889, when the defendants, without informing the plaintiffs, constructed an inspection chamber in such a way that two of the walls, 2 ft. 6 in. in diameter, rested on the pipe. It was a strong 6-inch pipe; the metal being 1⅛ inches thick. The pressure at which the water entered the main was 75 lbs. per square inch; whereas the pipe had been tested to bear a strain of no less than 2250 lbs. The accident happened at about 8·15 p.m., and it was not until midnight that the escape could be located, by which time the wood paving almost as far as Pall Mall had been ripped up, and other serious mischief done. Plaintiffs submitted that the breakage of the pipe was not caused by pressure of water. Defendants counterclaimed in respect of damage done to them in the matter, on the ground that there was something faulty in the construction of the pipe. A number of witnesses gave evidence to the effect that there was no defect in the pipe; that the bursting was not caused by excessive water pressure; and that immediately the pipe burst prompt measures were taken to stop the outflow of water and prevent further damage. For the defendants, evidence was given with a view to proving that there had been a subsidence in the neighbourhood which was quite sufficient to cause the breakage of the main. Several of the witnesses also stated that, having regard to the point at which the fracture occurred, it could not have been occasioned by vibration arising from the passing of traffic over the inspection chamber. In the result, his Lordship held that the plaintiffs had failed to prove that the bursting of the main was due to any act of the defendants, and dismissed the action with costs. On the defendants' counterclaim, he entered judgment for them for £35, and costs.

The "Reasonable Weight" of a Steam-Roller.

At Watford, on Monday of last week, judgment was given by his Honour Judge Howland Roberts in regard to a claim for 17s. 6d. made by the Colne Valley Water Company against the Wealdstone Urban District Council for damages to a water-main by a steam-roller. His Honour said he had come to the conclusion that, notwithstanding its age, the main was, before the damage was done, in sound condition, able to withstand ordinary pressure, and fitted for the purpose for which it was laid. The Council should have known of the existence of the pipe beneath the road, and that a roller of too heavy a weight would be likely to cause damage. They had brought no evidence to show that a 10-ton roller was regarded as a reasonable weight; and he agreed with the Company's Engineer that a steam-roller constantly starting and restarting on the road would exert a greater pressure on the main than a heavy vehicle ordinarily passing along. It might have been convenient and economical to use this heavy roller; but there was no evidence brought to show that it was essential. He had come to the conclusion that the Council's roller had damaged the Company's main; and they had failed to show any statutory justification for such damage. He therefore gave judgment for the Company, with costs. Leave was granted to appeal.

Fine for an Unfenced Gas-Engine.

At Walsall, last Wednesday, Messrs. Parkes and Co., iron-founders, were fined £10 and costs for failing to fence a gas-engine. Mr. H. J. Peacock, Factory Inspector, stated that the proceedings were the sequel to a fatality which occurred at the works, when an engine-man by some means was drawn into the fly-wheel and crushed between the wheel and the bed of the engine. A visit to the works subsequently showed that there was an entire absence of fencing to the dangerous parts of the engine. For the defence, it was stated that no suggestion had ever been made previously that the firm should take greater precautions; and it was also contended that, if erected, fencing would be no protection to the man in charge of the engine, as it was necessary for him to attend to the various parts of the machinery while it was running.

Gas Workers' Wages at Huddersfield.

The Huddersfield Gas Committee, having received a petition from their employees for a minimum wage of 6d. per hour for adults, decided to defer consideration of the matter for three months. This course, however, did not meet with the approval of Mr. Pickles, who, at the last meeting of the Town Council, said it was stated a couple of months ago by Alderman Jessop, the Chairman of the Gas Committee, that the labourers received from 5½d. to 7d. per hour; but he (the speaker) found that the great bulk of the men—80 to 100—were paid 5½d. Thirteen got 6d., and one man 6½d.; while a few skilled men holding trustworthy positions got 7d. Men who received only 22s. 8d. a week, and had to pay 5s. 3d. a week rent, could not keep themselves and their families as they ought to be kept. This was a sweating wage; and it was a disgrace to the Corporation to pay it. Considering how expensive a place Huddersfield was to live in, the men were entitled to an increase; and he proposed that their wages be advanced to a minimum of 6d. an hour. In Leeds, Halifax, and Bradford, the gas-workers were paid 24s. per week of 48 hours. Mr. Beaumont seconded this; and Mr. Shaw (Vice-Chairman of the Gas Committee) agreed to the consideration of the proposal two months hence, when the result of the working of the reduction made in the price of gas would have been ascertained.

MISCELLANEOUS NEWS.

GERMAN CONTINENTAL GAS COMPANY.

Report and Accounts.

We have received, through Herr W. von Oechelhaeuser, the General Manager, a copy of the report and statement of accounts which will be submitted to the shareholders of this Company at the fifty-first annual general meeting to be held at Dessau to-morrow.

The report states that, after the Company had celebrated on March 12, 1905, the fiftieth anniversary of its foundation, a time of much anxiety and difficulty followed, in consequence of the disquiet which prevailed at Warsaw, which is the most important field of the Company's operations. The Company's employees at that place had for many years enjoyed the same social and economic advantages as their *confrères* in the German works; and it was only through outside incitation that they joined the general strike of workmen in Warsaw. They took part in it on political, and not on economic, grounds. Thanks to the ready support of the Russian military and civil authorities in providing workmen from the army, and to the exemplary devotion of the Company's Manager at Warsaw (Herr Otto Alberti), and his officers, the supply of gas was maintained without interruption; whereas neither in St. Petersburg nor in Moscow was such a consummation achieved. The conditions which prevailed at Warsaw could not, however, but have an adverse effect on the Company's receipts; but thanks to the distribution of its operations over more than one country, this effect was to a large extent counteracted by favourable returns from the German works. Thus the total profit for the year 1905 amounted to 3,090,335·24 marks (about £151,487), or only 279,493·23 marks (about £13,700) less than that for the prosperous preceding year. The Company are therefore in a position to declare a dividend on the share capital at the same rate as in the last four years—viz., 10 per cent. Auxiliary undertakings have brought in during the year a profit of 327,222·67 marks (about £16,040), chiefly on account of the working of patent rights owned by the Company.

The make of gas at the Company's German works showed an increase of 6·21 per cent. over that for 1904; but the make at Warsaw decreased by 5·08 per cent. So that the increase on the total make of the Company was only 0·31 per cent. A new works at Neumühl, for the supply of gas to certain outlying townships of Ruhrort, was brought into operation on Dec. 13 last. A long-distance main from Dessau to Oranienbaum was put into use at the beginning of October; and other long-distance mains were laid from the works at München-Gladbach and Rheindahlen to neighbouring small towns.

The general meeting is to be asked to approve an increase in the working capital of the Company by 3,000,000 marks, required to be expended on extensions, mainly at Warsaw and Frankfort-on-Oder.

The remarks which the report contains on the subject of vertical retorts are reproduced in another part of to-day's issue.

SAN PAULO GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Monday last week, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox in the chair.

The SECRETARY (Mr. G. H. Rogers) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN said his first duty was a sad one. It was to express the regret of the Board at the loss of their colleague Mr. J. R. Tyndale. As those shareholders were aware who had been in the habit of attending the meetings, Mr. Tyndale had been, for some time past, in a deplorable state of health; but for all that, he had been constant in his attendance at the meetings. Even the week before his death, he was as usual present at the Directors' meeting. In moving the adoption of the Directors' report and the accounts, he should have little to say, feeling sure that the shareholders one and all were thoroughly satisfied, as they had good reason to be, with the results of the past year's working and the financial position of the Company. The year had been an uneventful one. It was the second year of full working under the contract—February, 1902—with the Government, in virtue of which a considerable reduction in the price of gas for public and private lighting was made, and the whole of the street lighting was converted from flat-flame to incandescent burners. At the annual meeting a year ago, in reviewing the results of 1904 (the first year under the new contract), he ventured to say that "the first year would be the worst, and that every year in the future would be better." It was therefore gratifying to know that his expectation had been realized, and that during the past year—the second under the new contract—not only had they held their own, but they had gained ground. They had increased their gross receipts in San Paulo by £15,768, or 15 per cent., and the net profit by £4684, or 18 per cent. They had placed £5000 to the reserve account, or £200 more than last year, and were in a position to recommend the payment of a dividend of 8 per cent., as against 7 per cent., carrying forward a balance of £3670, or £271 more than in the previous year. Perhaps the most notable feature of the past year's working had been the sudden and unexpected rise in the Brazilian exchange and its effect on the Company's business. They were on a gold basis; and consequently their receipts for gas—whether for public or private lighting—paid in currency, rose or fell exactly in proportion as exchange rose or fell. The price in gold was always the same; but with a high exchange, of course, the £1 sterling purchased so many less milreis with which to pay their wages, and all working expenses incurred, in currency on the other side. So that were all their receipts strictly on a gold basis, a high exchange would affect the Company prejudicially. But they had a free hand with their residual products, the price of which to consumers was on a currency basis, and was regulated by supply and demand. So that, roughly speaking, the fluctuations in exchange did not seriously affect them, either one way or the other, as they otherwise would have done. One consequence, however, must not be overlooked—viz., that, with a high exchange, there was a reduction of price in milreis to the consumers, and the cheaper gas caused an increased demand, to the benefit of the Company. Regarding the revenue account, the receipts from public lighting were £24,463, against £23,679—an increase of £784. The number of lamps in use on Dec. 31 was 4257, as against 4208 on Dec. 31, 1904. The private lighting yielded £53,591, against £49,338 in 1904—an increase of £4253. The non-lighting or cooking-gas receipts amounted to £8796, against £6191, or an increase of £2605. The latter two increases totalled to £6858. The quantity of gas sold to private consumers was 12·14 per cent. over that of 1904, and no less than 55 per cent. over the quantity sold in 1901—the last year under the old contract at the price of 170 reis. The number of meters in use at the end of 1905 was 7906, as compared with 6840 at the end of 1904—an increase of 1066. The gas sales in 1905 produced £86,850; and in 1904 £79,208—an increase of £7642. The residual products showed excellent results; the increase in coke being about £7175, and in tar £1310, or a total of £8485 over last year. This splendid return was due to several causes, such as the higher rate of exchange, and the increasing demand for tar by the coffee planters, and for use on the streets and roads of the city; but the greatest credit was due to the enterprise and push of the Manager and staff in taking the retail business into their own hands, and the distribution in the Company's own carts direct to consumers. The Board anticipated a continuance of a satisfactory business from this source, though it was doubtful whether the record receipts of the past year would be always maintained. Meter-rents showed a satisfactory increase, but sundry receipts a small decrease; and, as before stated, the total receipts from all sources in San Paulo were £15,678 in excess of those in 1904. On the expenditure side, the manufacture of gas cost £8856 more than in 1904—principally attributable to coal, of which 1800 tons more were carbonized at a rather higher cost. Salaries, wages, repairs, and maintenance were all higher, owing to exchange, and to a liberal expenditure on works' renewals. Distribution of gas stood at a slightly lower figure; but the lighting and upkeep cost £2398 more than last year, principally due to higher exchange. General charges, owing to the same cause, were a little higher; and the total expenditure in Brazil showed an increase of £10,833. London expenses and income-tax were also slightly higher. The net result of the year's working was a profit of £29,782, against £25,098 in 1904, or an increase of £4684. Turning to the balance-sheet, the figures did not differ much from those presented last year. The capital expenditure during the year amounted to £6899, made up as follows: New mains, £3227: new lamps, £532; new meters and services, £2530; mains improvement, £604; and the small balance was for sundry purposes. The investments on account of the reserve fund had been increased by £5000 during the year. On the other side, the reserve fund figured at £39,000, and, with the proposed transfer of £5000, would be increased to £44,000. The exchange account had increased by £3702, for the reason given in paragraph 4 of the report: "The assets and liabilities of the Company in Brazil on Dec. 31 last have been valued at 16$\frac{1}{2}$d., as against 13$\frac{1}{32}$d. at the end of 1904. The increase in the value of the assets resulting from the higher rate of exchange amounts to £3702 13s. 1d., which sum has been carried to exchange account." This increased value, the Directors did not regard as profit; and so they put it to the special fund. The other items were much as usual. A glance at the figures of the balance-sheet would show that the Company's financial position was a thoroughly healthy one. The relations of the Company with the Government and the municipal authorities of the State of San Paulo continued to be on the most friendly footing; and the Directors had the satisfaction of knowing that the public recognized that the Company spared no effort to make the service as perfect as possible. The city of San Paulo increased year by year in a marvellous manner; the population being now estimated to be about 300,000 In conclusion, he must not omit to refer to the zeal and ability of their Manager in San Paulo (Mr. Richard Gray), and of their Engineer (Mr. Whyte), to whom they owed a cordial vote of thanks.

Mr. A. F. PHILLIPS, the Managing Director, seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. M'KERROW, a final dividend of 5 per cent. was declared, making a total distribution of 8 per cent. for the year.

Mr. M'Kerrow, who had been elected to the Board consequent on the death of Mr. Tyndale, retired in accordance with the Articles of Association; and, on the motion of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, he was unanimously re-elected.

The Auditors (Messrs. Cash, Stone, and Co.) having been re-appointed, on the motion of Mr. BARREYMAN, seconded by Mr. GRANT,

The CHAIRMAN proposed a cordial vote of thanks to the Manager (Mr. Gray), with whose services, he said, the Directors were extremely pleased. In Mr. Whyte, too, the Board were confident they had a good technical adviser; and, as for the other part of the staff, he ought to mention the name of their Accountant (Mr. Kirchert).

Dr. STRAIN, in seconding, said from personal experience of many years' standing in San Paulo, he was able to assure the shareholders that they had engaged in the management of their gas-works a most efficient staff, who were zealous and unremitting in their attention to the shareholders' interests. His own impression, coming home from San Paulo, was that he had seen no better lighted city, even in England, than San Paulo was at the present day. The lighting gave very general satisfaction—especially since incandescent lighting had been adopted in the streets, nothing but expressions of satisfaction were to be heard on all sides. So long as the Company continued to give the satisfaction they had been doing during recent years, the shareholders had nothing to fear from electricity, or any other form of competition.

The motion was very heartily accorded.

On the proposal of Mr. BARREYMAN, a similar compliment was paid to the Chairman and Directors.

The CHAIRMAN said the past year or two had given the Chairman and Directors a great deal of anxiety, seeing that they were not quite sure how the alteration of the contract would turn out; but it was a satisfaction to them to find that they did the right thing.

This concluded the proceedings.

ILFORD GAS COMPANY.

In moving the adoption of the report and accounts for the half year ended Dec. 31 (noticed in last week's "JOURNAL," p. 821), at the recent meeting of the Ilford Gas Company, Mr. W. Ashmole, the Chairman, congratulated the stockholders upon the evidence before them of the very satisfactory working of the business during that period. He said the story told by the revenue account was a very gratifying one; and the balance carried to profit and loss account proved conclusively that the position of the Company as a profit-earning undertaking was being well maintained. The growth of gas lighting in Ilford, notwithstanding the competition of electricity and other illuminants, had really been phenomenal. During the last five years, the volume of gas sold for lighting, heating, and cooking purposes had more than doubled. The quantity of gas sold in 1900 was 128 million cubic feet; and in spite of the fact that practically the whole of the public lighting had in the interim been undertaken by the Urban District Council, the output had increased to 263 millions in 1905. The progress of the past few years had been the result of unremitting attention on the part of those responsible for the working of the Company's business; and he was sure the stockholders fully appreciated the loyal interest displayed in their service. The activity of a few years ago in building operations had somewhat abated in Ilford, and the growth of business was therefore not quite so large as usual; but an increase in the volume of gas sold during the year amounting to over 20 million cubic feet could not be deemed unsatisfactory. He was pleased to say that the output so far pointed to an equal, or even greater, increase being obtained during the current year. To extend the use of gas for heating purposes, a new departure had recently been made in placing gas-fires on hire at low rentals. The system adopted had proved very successful, and more than 200 fires were now on hire, while over 100 had been sold outright. The Board believed that gas for heating, as well as for lighting purposes, had a great future before it; and the effort now being made was therefore a step in the right direction, and one that could not fail to prove beneficial to the business of the Company, while affording facilities for obtaining better hygienic conditions for the consumers. The new and more commodious show-rooms in course of construction would, when completed, furnish a much-needed opportunity for effectively displaying and demonstrating the uses of modern gas appliances, and should materially assist in enlarging the Company's sphere of usefulness. During the half year, 643 new consumers were supplied with gas, and 435 additional cookers were placed on hire; bringing the total number of consumers to 9407, and of cookers on hire to 5891. Taking the whole of the year 1905, 1168 new consumers were obtained, and 976 new cookers were fitted. Such increases as these afforded unimpeachable evidence of the vitality of the undertaking. As to manufacture, he was pleased to say that, anticipating the rise which had recently taken place in the price of gas coal, contracts were entered into last year which would satisfy their requirements until June, 1907. Under these contracts, the raw material for next year would be obtained on rather more favourable terms than those of the present year; and it was a matter for congratulation that, while prices had advanced by something approaching 1s. 6d. per ton, the Company's supplies would be forthcoming at rather less than the old rate. The works and plant generally were now in good working condition, and with the expenditure of a small additional amount of capital, were capable of meeting a largely-increased demand. The inclined retorts designed and erected by their Engineer (Mr. A. A. Johnston) were yielding excellent results, and had had the effect of substantially reducing the cost of production. The labour charges were extremely low, and, compared with 1902, showed a reduction of 30 per cent. In addition, the production of gas per ton of coal carbonized had also reached a high figure. During the past half year, over 11,200 cubic feet per ton was made. In the last three years, the quantity of gas sold per ton of coal carbonized had increased very materially; and few gas companies could now show better results than those obtained at Ilford. Various alterations and improvements had been made which would tend to still further cheapen production. At the end of 1902, the amount of capital invested per million cubic feet of gas sold had reached the sum of £1140, and for two years previous had stood at £1182 and £1139. Latterly, by means of improved methods of manufacture and alterations to plant which had increased its capacity, and by reason also of the greater demand, the ratio of capital invested to gas sold had rapidly decreased, until it now stood at only £890 per million feet, as compared with £1140 in 1902—thus reducing by nearly 25 per cent. the capital charges to be borne by the gas, and assisting to bring about the reductions, amounting to 4d. per 1000 cubic feet, in the selling price which had been made during the past two years. Continued expansion could not fail to have a similar effect; and the Board hoped in the near future to be in a position to announce a further reduction. The figures in the revenue account indicated a high degree of excellence in working, and were better than any previously recorded.

The report and accounts were adopted; and the usual dividends, at the rates of 6 per cent. per annum on the "A" and "C" stocks and 4½ per cent. per annum on the "B" stock (less income-tax), were declared.

Increased Cost of Public Gas Lighting in Dublin.—When the adoption of the estimate of the Lighting Committee by the Dublin Municipal Council was moved by Mr. Monk, the Town Clerk said he had received a letter on the subject from the Secretary of the Committee. This stated that, subsequent to the preparation of the estimates, the Committee learnt that the price of gas had been increased from Jan. 1 by 2d. per 1000 cubic feet—adding that no notice was sent by the Gas Company of any arrangement to alter the price. They pointed out that this extra 2d. would mean an addition of £410 to the contemplated outlay. The estimate amounted to £24,642; and the motion to adopt it was agreed to. Several members, however, thought that, in view of the circumstances, there should be an increase in the sum allowed. Alderman Cotton, in the course of the debate, explained that the cost of public gas lighting was only £8100, not £24,600. The balance of the £24,600 was for electric lighting.

COLONIAL GAS UNDERTAKINGS.

Following upon the meetings of the Australian Gaslight Company and the Metropolitan Gas Company of Melbourne, which were noticed in the "JOURNAL" a fortnight ago, some further reports are now to hand with regard to the results of recent working of gas undertakings in the Colonies.

The statement of accounts of the Brisbane (Queensland) Gas Company for the half year to Dec. 31 shows a net amount to the credit of profit and loss (including the balance from the previous half year) of £12,319. Out of this, the Directors recommended the payment of a dividend of 5 per cent., which, with the tax thereon, would absorb £8400; leaving £3919 to be carried forward. The report states that at a special meeting of shareholders held on Aug. 14, it was decided to increase the capital of the Company by converting £20,000 of the reserve into 4000 fully paid-up shares. A piece of land centrally situated has been purchased for the erection of new offices. The profit and loss account contains an item of £1245, paid under protest, for income-tax on distribution of capital and of land suspense account.

At Maryborough, the working for the last half of 1905 (with the sum carried forward from the previous six months) resulted in a profit of £1024. From this, the Directors recommended the payment of a dividend at the rate of 6 per cent. per annum, which would absorb £771; and leave a balance of £253 to be carried to the next accounts.

The report of the North Shore Gas Company, after the remark that the plant is in a satisfactory condition, states that the net profit on the sale of gas, &c. (after allowing for reserve and depreciation), for the past six months amounted to £5229, to which had to be added the balance of £65 brought forward from the previous six months. This was sufficient for the payment of a dividend of 3¾ per cent. for the half year, free of income-tax, and to leave a balance of £24 to be carried forward.

The Wellington Gas Company experienced a considerable increase in the consumption of gas last year; the growth of the demand being indicated by the fact that upwards of 3¼ miles of new mains were laid and 844 new services fixed. The Directors state that during the past twelve months £5033 was expended out of revenue on repairs and maintenance of the plant, which is kept in thorough order and efficiency. On Oct. 1 the price of gas was reduced by 5d. per 1000 cubic feet; making the net charge 5s. 5d. A dividend of 5 per cent. was paid on July 1; and a similar distribution was recommended by the Board for the past half year. The reserve fund has been increased to £25,000, and a sum of £4462 transferred to the works extension reserve from profit and loss account. The receipts from sales of gas, products, &c., were £64,754; while the expenditure was £42,049.

GOOLE GAS AND WATER WORKS.

The Undertakings to be Separated.

The Goole Urban District Council had under discussion at their last monthly meeting the question of the division of the capital of the gas and water undertakings. The matter had been fully considered by the Gas and Water Committee at a special meeting; the basis of their deliberations being the accounts for the year 1904-5, and a statement of the capital expenditure on gas and water supply from the date of the purchase of the undertakings to March 31, 1905, submitted by the Clerk. The accounts showed that the total amount of the original debt on March 31, 1905, was £124,486, of which £15,825 had been paid off; leaving £108,661. The net profit on the year's working was £1088, compared with £42 in 1903, and £184 in the preceding year. From 1902 to 1905 inclusive, £9424 had been expended on gas and water plant out of the accumulated net profits; and the works stood in the balance-sheet for £131,866.

As the result of the Committee's deliberations, they recommended as follows: (1) That the gas and water undertakings be divided as from March 31, 1906. (2) That the capital value be the amount owing on loan, the value of the stocks and stores on hand, and the cash balance on that date. (3) That the basis of division be 70 per cent. and 30 per cent. respectively, and that the division be as follows: Gas, 70 per cent. of the money on loan and 70 per cent. of the cash balance, and the gas in stock and stores on March 31, 1906; water, 30 per cent. of the money on loan, 30 per cent. of the cash balance, and the water in stock and stores on March 31, 1906. (4) That the annual repayments of existing loans be charged 70 per cent. to gas and 30 per cent. to water, but all future loans to be charged against the service requiring the loan. (5) All departmental expenses to be charged against each department; but where not possible, the expenses to be charged 70 per cent. to gas and 30 per cent. to water. (6) That the proceeds of the sale of the Rawcliffe Water-Works and the old Goole Gas-Works be divided in the proportions of 70 per cent. gas and 30 per cent. water. After some explanations had been given as to the position, the Committee's recommendations were unanimously adopted.

When the Committee's minutes, which included the recommendations, were brought up at the monthly meeting of the Council, and their adoption had been moved and seconded, Mr. Holmes said it had been stated that the Water Department did not pay its way, and that gas had to be called upon to make up the deficiency. After carefully considering the question, the Committee came to the conclusion that, if they adopted the proposed basis of division, water would pay its way, and that there would actually be a profit on the year's working of about £61. The division of the two departments was not with the idea of running one against the other, but merely for the more convenient working of both concerns; and he thought both ought to show a profit. Mr. Turton was very pleased that the Committee had been able to locate a substantial amount from the Gas and Water Department towards the reduction of the rates. This allocation was rather belated, because the money came from the profits for the year ending March, 1905. He was Chairman during that year, and also through

the darker days of two or three years previously, when they scarcely knew how they were going to pay one month's bills after another, and when they had to leave a little bit in order to get over the month. Now they had £4000 in the bank, and might congratulate themselves, and personally he looked favourably on both the gas and water concerns. He was only sorry that, after allocating £888 to the relief of the rates, they had not been able to reduce the price of gas by another 2d. per 1000 cubic feet. He thought they might have managed this. Mr. Blyth said he considered that water had been fairly liberally treated. The town was to be congratulated on being owners of so excellent a water supply. With regard to the Gas Department, he considered it was carrying as much financial burden as it possibly could. Referring to the working balance of £1540 and £660 standing to the credit of the respective concerns, he said the profits for the current year would be something like £1000, which, on the basis of division, would make the water balance £300 more. In the case of gas, he thought the department should at all times have a credit balance of £2000 to £3000. So far as the money voted to the relief of the rates was concerned, it would amount to about a 4d. rate. He concluded by paying a tribute to the Engineer and Manager (Mr. T. E. Franklin) for his efficient management of the works—remarking that if the demand for gas continued to increase, the Council would not have much difficulty in reducing the price from 2d. to 4d. per 1000 cubic feet in the course of a year or two. The minutes were then confirmed.

DISMISSAL OF OLD WORKMEN.

Sir George Livesey Testifies to their Carefulness.

In the course of the recent debate in the House of Commons on the subject of old age pensions, a statement is reported to have been made by Mr. E. Edwards, the member for Hanley, referring to the Workmen's Compensation Act, to the effect that great limited companies had not much regard for workmen who were advanced in years, and dismissed them rather than run the risk of having to pay compensation for injury. This remark brought a reply from Sir George Livesey, which appeared in last Saturday's "Times." The writer said:

I can believe it possible, where the employed have no interest in their employer's prosperity, and there is no attachment between the parties, that the latter has very little hesitation in dismissing his men; but this is not the case with many of the largest joint-stock companies, where mutual beneficial arrangements exist. This, however, by the way. My object is to deal with the statement that men as they advance in years are more liable to accidents. This statement has often been made; and I have heard that insurance companies have an objection to such men. But a lifelong experience leads me to doubt its validity. I believe that the care and skill resulting from long experience of work must make men as they grow older less liable to accidents. I have therefore put the matter to the test.

This [South Metropolitan Gas] Company employ rather over 5000 men in the summer and about 1000 more in the winter. I have, on a recent pay day, ascertained the ages of 5715 men. We have through our accident fund (mutually supported) kept an exact account of all accidents that have caused incapacity for three days and upwards during the last eight years. The ages of 2114, or very nearly all the injured men, at the time when the accidents happened are known. The youngest employee is 15, and not many are over 65, at which age they can claim their pensions. The proportion or percentage of accidents at various ages is given below. After trying five-year periods, I found ten-year gave very nearly the same results. "Up to 20" includes 20; and "over 60" includes all above 60:—

Age.	Number of		Percentage of Accidents.	
	Men.	Accidents.	In the Eight Years.	Average per Annum.
Up to 20	398	117	29·4	3·70
,, 30	1742	718	41·2	5·15
,, 40	1941	734	37·8	4·70
,, 50	1016	389	38·3	4·80
,, 60	427	128	30·0	3·75
Over 60	191	28	14·7	1·80
	5715	2114	37·0	4·60

Putting it in another way—

	Up to 20	30	40	50	60	Over 60 years.	
Percentage of men . . .	7 ..	30½ ..	34 ..	17¾ ..	7½ ..	3½	= 100
Percentage of accidents .	5½ ..	34 ..	34¾ ..	18½ ..	6 ..	1¼	= 100

Taking five-year periods, that ending at 30 has the highest and that ending at 65 the lowest percentage of accidents. The less dangerous work to which old men may be put, does not nearly account for the reduced proportion of accidents. I would much rather entrust an exceptionally dangerous job to a man over 50 than to one of 30 years of age.

Gas manufacture involves a great variety of work with much machinery, and affords, I should think, a fair test of the question whether advancing years increases the liability to accidents. If it is a fair test, that question is certainly answered in the negative.

It is stated that the Local Government Board have declined to send an Inspector down to Mossley, to inquire into the alleged cases of lead poisoning in the borough and the state of the water generally.

COMPANY v. MUNICIPAL GAS UNDERTAKINGS.

Some Figures from Wales.

At a Meeting held under the auspices of the Cardiff Property Owners' and Ratepayers' Association, to hear an address on municipal trading, the Chairman (Mr. A. Beasley), the President of the Association, in the course of his opening remarks, referred to the question of street lighting. Taking, he said, the two years 1894 and 1904, what did they find? That in 1894, when the town was lighted entirely by gas, the total cost of street lighting was £7714, including all labour, which was supplied by the Gas Company, and all the repairs. In 1904, the cost of street lighting had gone up to £15,948, of which £6480 represented the cost of gas, notwithstanding that, in the interval, the electric light had been introduced, and notwithstanding that the electric light so introduced had cost far and away more by itself than the whole gas accounts came to in 1894. Fortunately the gas in Cardiff—he said fortunately, and the majority of the audience he believed would agree with him—was not owned by the Corporation. He would tell them why he said fortunately. He had before him two examples of what might be accomplished by municipal bodies taking over local gas undertakings. The Rhondda Valleys acquired a gas undertaking in 1898. In that year the charge for gas was 4s. 3d. per 1000 cubic feet. In 1905, the rate was still 4s. 3d.; and the indebtedness of the district in respect of the acquisition of the gas undertaking amounted to £208,535. In the second instance—Pontypridd—the gas undertaking was acquired in 1892. In that year the charge per 1000 feet was 3s. 4d. In 1905, it was 3s. 3d.; and he did not hesitate to say that in the second of these two instances the quality of the gas had enormously deteriorated. He had had himself to make numerous complaints to the public authorities as to the quality of the gas supplied for lighting the Taff Vale Company's station. Now, the Pontypridd station was not a thing of beauty, though it might be a joy for ever; and when it was illuminated, if they could use the term, by the gas supplied by the District Council—well, it was a place that people would not care to visit twice. He thought on occasions they had had to take the lamps off the trains for the purpose of seeing where the gas-lamps were. Now, take the other side of the picture. The Cardiff gas undertaking was worked by a private Company. In 1892, the charge per 1000 cubic feet made by the Company was 2s. 10d.; in 1905, it was 2s. 9d. These were the charges to private consumers; and he dared say they had seen it stated in the newspapers that the Gas Company had agreed to further reduce the charge to 2s. 7d. Some of them might say, and rightly so, that this had been brought about under pressure by the Corporation. But did not that show how unnecessary it was for corporations to acquire gas undertakings, when they could put on pressure from time to time to reduce the charges? At Merthyr, the gas undertaking was in the hands of a private Company. In 1892, the charge there was 3s. 8d. per 1000 feet. In 1905, it was 2s. 10d. If they compared these charges of 2s. 9d. (to be reduced to 2s. 7d.) and 2s. 10d., with the 3s. 3d. and 4s. 3d. charged by municipal bodies, he thought they would say that the figures offered no sort of encouragement to them to take over and work the gas undertakings in the so-called public interest.

LINCOLN CORPORATION WATER SUPPLY.

Water Tapped at the Boultham Bore.

Great satisfaction has been caused in Lincoln by the news that the men engaged on the deep bore at Boultham have at last struck water. This occurred at nine o'clock last Wednesday evening. The brick shafting, 9 feet in diameter, has been completed to a depth of 1502 feet; and from thence a small bore has been made to a depth of 61 ft. 6 in. At this depth the water was tapped; and the supply promises to realize all expectations—especially when the sandstone is bored right through, and all underground streamlets are tapped. The water is not brackish. The original estimate was that the upper strata of the sandstone would be tapped at 1400 feet; but the blue clay bed was found to be 100 feet deeper than was calculated by the geologists.

The actual boring was commenced in August, 1901; and it may be remembered that at a depth of about 900 feet the Contractors had the misfortune to lose their boring-tool. This accident was most unfortunate, for it caused a delay of about 16 months in the work; the tool being lost in November, 1903, and not recovered until March last year. For the purpose of its recovery, the Contractors had to sink a shaft for a distance of about 900 feet. After it had been found, the Water Committee decided to continue the shafting, and it was finished at a depth of 1502 feet. Below that a pilot bore—*i.e.*, a smaller bore some 3 inches in diameter—was driven to a distance of exactly 61 feet; and it was at this depth that water was tapped. What happened at the last moment was this: The water came up the 3-inch hole into the shafting, and rose to the extent of a foot, when the men employed in the bore began to bale it out with all possible speed. In their attempts to check the flow, they plugged up the hole with lead, clay, and concrete; but, in spite of this, the flow has continued to force its way up. This state of things must be entirely stopped before the work can proceed, and the bottom of the well can be made. Concrete will be used as the base, and then the Contractors have to fix into it an iron guide-pipe, through which the boring will ultimately have to be carried to its full depth, which is estimated at 2200 feet. At this distance, it is expected that the full volume of water will be reached. But after the completion of the bottom of the well, it will no longer be necessary for the workmen to carry on their operations underground, as the boring-tool can be driven from the top of the well, which will be done so long as the quantity of water continues to increase. We understand that Mr. Percy Griffith, M.Inst.C.E., who is advising the Corporation in this matter, is now reporting to the Water Committee on the question of providing the necessary pumping plant, in order that the city may be placed in possession of the supply at the earliest possible moment.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held their annual statutory meeting on Monday—making it, at the same time, their monthly meeting. The report of the Engineer showed an increased output of gas during February of 1,965,000 cubic feet, and since May 16 of 57,000 cubic feet. The Works Committee reported that they had adopted and recommended a report by a Sub-Committee, in which it was submitted that a docket in red ink should be attached to the face of all forms of accounts, intimating that the Commissioners would: (1) On receipt of a request, send competent inspectors to investigate and report upon the cause of any defective lighting or insufficient supply of gas, free of cost to the consumer; (2) undertake the supervision of any lighting installation by incandescent gas, or by other means of gas lighting, and make a periodic inspection for the purpose of cleaning burners and renewing parts, the consumers being charged the cost for time and materials used, or, alternatively, that the Commissioners would undertake to uphold and maintain a lighting installation in an efficient state at so much per burner per annum; and (3) supply and fit up incandescent burners and other fittings of every description, and undertake large or small installations, or the fitting up of single burners in consumers' houses, charging therefor the cost of materials used and time occupied in fitting up. The Commissioners, without comment, adopted the recommendations. In the Works Committee, objection had been taken to the charges of the deputations to London in connection with the regulations for the use of locomotives on factory sidings. In particular, objection was raised to a professional fee of fifteen guineas which had been paid to the Clerk; but the Committee had, by fourteen votes to two, approved of the payment. After some discussion by the Commissioners, the action of the Committee was homologated by 13 votes to 2—one member declining to vote. In a letter from the Town Clerk of Edinburgh, it was stated that the Public Health Committee had had before them a letter from Mr. G. G. Pattison, W.S., renewing the complaint formerly made as to smells from the Granton Gas-Works, and that they had asked the Medical Officer of Health—Sir Henry Littlejohn—to report upon the matter.

The Corporation of Dundee are contemplating the promotion of a Provisional Order for municipal purposes; and the Gas Committee have resolved to have a clause inserted giving power to inspect gas-pipes in new houses previous to their being covered up.

What has come to be designated the Uddingston gas controversy was debated before Sheriff-Substitute Thomson in the Sheriff Court at Hamilton on Tuesday. As stated in this column last week, Mr. John Turner, of Camphill, seeks to interdict the Bothwell and Uddingston Gas Company from enforcing a demand note to pay for gas consumed, and from interfering with the gas meter and fittings in his house; and, having consigned the amount in dispute, he was granted interim interdict. Mr. Turner, who appeared on his own behalf, said that for the quarter ending Jan. 30 last he had been served with a demand for nearly double the amount asked in the corresponding quarter of the previous year. In this matter he was not alone, because over the whole lighting area there had been an almost universal increase in the quantity of gas alleged to have been consumed—the increases ranging from 15 to almost 100 per cent. Mr. A. P. Smith, for the Gas Company, submitted that the application was irrelevant. Mr. Turner had not challenged his meter; and all his statements about public meetings were altogether irrelevant to the subject. As a matter of fact, the Surveyor was in Mr. Turner's premises on Oct. 25, and the account was charged as from the 30th. The Surveyor could not be in all the premises in the town on Oct. 30. The pursuer was objecting to a mere technicality in the account. He contended that this did not entitle him to come there and seek to interdict the Company from exercising the remedy they were entitled to. A gas company had statutory powers; and these proceedings were not under the Gas Acts. Mr. Turner, in reply, said he was prepared to lodge a petition in terms of the Act, within fourteen days. Sheriff Thomson said he quite admitted that the true remedy was to be got under section 20 of the Gas-Works Clauses Act, 1871. He therefore, in respect of the undertaking to bring an action within fourteen days, continued the interim interdict. In his opinion, the full amount claimed having been consigned, the Company would not suffer any prejudice, and it would be oppressive for them to exercise their right to cut off the gas altogether as a compulsitor for payment of a sum which had been consigned, and regarding which there was a *bonâ fide* dispute.

The Kilmarnock Town Council have again had a long discussion over the price charged for gas supplied through prepayment meters, and have at last settled it. The Gas Committee recommended that the extra charge should be reduced from 7½d. to 5d. per 1000 cubic feet. Mr. Clunie, who has championed the cause of the prepayment consumers throughout, moved that the extra charge be 1d. per 1000 cubic feet. Bailie Hare thought 2½d. extra would be a fair charge. Mr. M'Kerrell thought that if the prepayment meters were let cheaper, there would be a much bigger consumption of gas. Treasurer Gemmill said he would abolish prepayment meters altogether. The people who got them did so because they were in the habit of failing to pay their gas accounts. It was ultimately agreed, by the casting vote of Provost Hood, to make the extra charge 5d. per 1000 feet, as recommended by the Committee.

The Edinburgh and District Water Trust have this week fared badly in their litigation with the Clippens Oil Company, Limited. In the action now dealt with, the Company sued for damages to the amount of £137,000 in respect of their works having been compulsorily closed by interdict obtained by the Trust against the working out of the support for the water-main; the interdict having been granted in March, 1897, and judicially recalled in February, 1898. In the Outer House of the Court of Session, Lord Pearson awarded the Company £15,000. Both parties reclaimed; and the Trust obtained the consent of the Court to add a plea to the effect that the action was barred by the Public Authorities Protection Act, in respect that it had not been brought within six months of the injury. The case was disposed of in the First Division of the Court on Tuesday, who held that the action having been raised in May, 1898, was within six months of the disposal of the question of interdict. In the opinion of Lord Dunedin, the wisdom of the Trustees came rather late in the day, as had they tabled their plea at the commencement, and it had been held to be good, needless costly proceedings might have been avoided. But they could not hold it to be good. On the merits of the case, they agreed with Lord Pearson, but directed an increase of the damages to £27,000, with expenses.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 848.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21⅛—22⅛	..	4 13 4
160,000	10	,,	7½	Do. 7 p.c.	15—16	..	4 13 9
200,000	5	Nov. 15	7	Bombay, Ltd.. . . .	6⅞—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	4¾—5¼	..	5 6 8
50,000	10	Mch. 9	14	Bourne-) 10 p.c. . .	28½—29½*	..	4 14 11
51,810	10	,,	7	mouth Gas) B 7 p.c. .	16½—17¾*	..	4 0 0
53,200	10	,,	6	and Water) Pref. 6 p.c.	15—16*	..	3 15 0
380,000	Stk.	Feb. 22	12½	Brentford Consolidated	263—268	+3	4 13 3
300,000	,,	,,	9½	Do. New . . .	192—197	..	4 16 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	123—128	..	3 16 11
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Mch. 9	11½	Brighton & Hove Orig.	230—235*	..	4 15 9
246,320	,,	,,	8½	Do. A. Ord. Stk. .	163—168*	..	4 18 3
460,000	20	Sept. 28	10	British	43⅜—44½	+⅛	4 9 10
100,000	Stk.	Feb. 22	6	Bromley, Ord. 5 p.c. .	120—123	+1	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	92—93	..	4 16 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12⅛—13	..	5 7 8
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
150,000	20	Mch. 9	8½	Cagliari, Ltd.	23—25*	..	6 12 0
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.. .	10—10⅜	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,443,280	Stk.	Feb. 22	5⅛	Commercial 4 p.c Stk. .	114—116	..	4 9 7
560,000	,,	,,	5	Do. 3½ p.c. do. .	111—113	..	4 8 6
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	129—132	−1	4 18 6
200,000	,,	,,	7	Do. 7 p c Pref.	143—148	..	4 14 7
432,070	Stk.	Feb.	5½	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
480,090	10	Jan. 25	11	European, Ltd. . . .	22½—23½	..	4 13 7
354,090	10	,,	11	Do. £7 10s. paid	16½—17½	+½	4 14 4
15,223,235	Stk.	Feb. 8	4⅛	Gas-) 4 p.c. Ord. . .	98½—99½	..	4 8 5
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	88—90	..	3 17 9
3,709,735	,,	,,	4	and) 4 p.c. Con. Pref.	108—110	..	3 12 9
4,193,975	,,	Dec. 14	3	Coke) 3 p.c. Con. Deb.	88—90	..	3 6 8
258,740	Stk.	Mch. 9	5	Hastings & St. L. 3½ p.c.	98—102*	..	4 18 0
82,500	,,	,,	6½	Do. do. 5 p.c.	121—124*	..	5 4 10
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	20—21	..	5 4 9
3,800,000	Stk.	Nov. 15	10	Imperial Continental .	232—234	−1	4 5 6
473,600	Stk.	Feb. 8	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	123—128	..	4 13 9
561,000	Stk.	Feb. 22	10	Liverpool United A . .	234—236	..	4 4 9
718,100	Stk.	Feb. 22	7	Liverpool United B .	167—169	+1	4 2 10
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 2	5	Met. of) 5 p.c. Deb..	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	104—106	..	4 4 11
541,920	20	Nov. 15	3½	Monte Video, Ltd. . .	11½—12½	..	5 12 0
1,675,892	Stk.	Feb. 22	4½	Newc'tle & G'tesh'd Con.	107—108*	..	4 5 8
406,025	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Mch. 9	10	North Middlesex 10 p.c.	19—20*	+½	5 0 0
52,940	10	,,	7	Do. 7 p.c.	12½—13½†	..	5 3 8
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	150—153	+1	5 4 7
600,000	5	Sept. 14	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	Apl. 28	6	Primitiva Ord. . . .	7—7⅞	..	4 0 0
796,980	5	Jan. 25	5	Do. 5 p.c. Pref. .	5⅛—5⅜	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	98—100	..	4 0 0
851,070	10	Oct. 13	7	River Plate Ord. . . .	13—13½	..	5 3 8
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	98—100	..	4 0 0
250,000	10	Sept. 28	8†	San Paulo, Ltd. . . .	14¼—14⅝	+⅛	5 8 6
70,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	50—52	..	4 16 2
135,000	Stk.	Sept. 14	10	Sheffield A	248—250	+4	4 0 0
209,984	,,	,,	10	Do. B	248—250	+4	4 0 0
523,498	,,	,,	10	Do. C	248—250	+4	4 0 0
126,106	Stk.	Mch. 9	5⅛	Shrewsbury Ord. 5 p.c.	108—118*	..	4 13 3
70,000	10	Sept. 28	10	South African	16—17	..	5 17 8
6,250,000	Stk.	Feb. 22	5⅛	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Mch. 9	5⅛	S'th Suburb'n Ord. 5 p.c.	120—123*	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130*	..	3 16 11
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord. . .	109—112	..	4 9 3
120,000	Stk.	Mch. 9	6¼	Tottenham) A 5 p.c. .	124—127*	..	4 18 5
363,020	,,	,,	4½	and) B 3½ p.c. .	99—102*	..	4 13 2
137,500	,,	Dec. 14	4	Edmonton) 4 p.c. Deb.	105—107	..	3 14 9
182,380	10	Dec. 29	8	Tuscan, Ltd.	10—10½	..	8 0 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
30,000	Stk.	Feb. 22	7⅛	Wands-) A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	133—136	..	4 11 11
75,000	,,	,,	5⅛	and) C 3½ p.c. . .	110—113	..	4 16 0
69,416	,,	Dec. 29	3	Putney) 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Mch. 9	5⅛	West Ham 5 p.c. Ord. .	107—109*	+1	4 14 0
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	121—124*	..	4 0 8
193,300	,,	Dec. 29	4	Do. 4 p.c. Deb. Stk.	106—109	+2	3 13 5

Prices marked * are "Ex. div."

† Next dividend will be at this rate.

CURRENT SALES OF GAS PRODUCTS.

Week ending March 24.

There is a very good demand for tar products in the London district, but chiefly for forward delivery. Prompt business is quiet, except that deliveries are being well taken; and there is a very good inquiry for pitch and benzol. London makers are hardly quoting for pitch, being well sold; and they do not need to accept present low prices for forward delivery. Benzol, 90 per cent., is 9¾d. per gallon net. 60° crude carbolic acid is firm at from 1s. 9¾d. to 1s. 10d. net, and a good business has again been done in it for July-December. 90 per cent. toluol is firm, and inclined to advance. Liquid creosote is well inquired for, and ordinary would not be sold at under 2d. per gallon net, in bulk. Sulphate of ammonia maintains its late dead level. The most recent sales are stated to have been on the basis of £12 10s., Beckton terms; but makers are understood to be almost sold out to the end of April.

LIVERPOOL, *March* 24.

Sulphate of Ammonia.

Again there has been a steady demand; but although it has been sufficient to absorb current production, it has not been enough to bring about an advance in values. The closing quotations therefore remain £12 5s. per ton f.o.b. Hull, £12 6s. 3d. to £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. The most encouraging feature in the situation is the large demand for Home consumption, in Scotland as well as in England. There has been large inquiry for delivery over the late months of the year; but buyers' ideas are below spot prices, and no important business has transpired. For near months there has been inquiry, but here again the question of price has stood in the way, makers requiring some premium on spot prices.

Nitrate of Soda.

This article remains very firm, to-day's prices being 11s. 3d. and 11s. 6d. per cwt., for ordinary and refined qualities respectively.

LONDON, *March* 24.

Tar Products.

Business generally has been quiet during the past week, and the outlook is not brilliant. So far as pitch is concerned, it is rather difficult to fix the exact value, as several of the smaller manufacturers are evidently anxious to place some quantities for early delivery, so as not to hold stocks during the summer months. Sales have been made on the East Coast at 27s. for early shipment; while business is reported in London at 28s. 6d. This has, however, been by dealers, as the largest manufacturers, as a rule, ask rather higher prices. The South Wales briquette makers appear to have filled up their requirements for early delivery; but they are anxious to buy over the last six months of the year, as it is expected there will be a strong demand for briquettes from abroad, owing to the shortage which must occur in the output in the Pas de Calais district should the strike spread to any extent. It does not appear likely, however, that the market for this article will improve at present, as there is undoubtedly plenty offering for early delivery. The Lancashire makers are not quite so anxious to sell as was the case a little while ago; but, at the same time, there are considerable quantities offering in this district. There has been no actual business done in anthracene, though there has again been an improved inquiry, which it is stated, however, is not for the purpose of making alizarine, but for a new process for which the present price of this article might render it available. There is a fairly good demand in toluol for prompt delivery; but business in this article is very limited, owing to the fact that manufacturers are not at all anxious to sell for forward delivery just at present, and there are practically no stocks. In solvent naphtha, the demand is still good for March-April, but there is not very much inquiry for forward delivery; and it is generally believed that prices may be easier a little later. In carbolic acid, there has certainly been a fair business doing at 1s. 9½d. to 1s. 10d. for 60's; and it is reported that English consumers have lately purchased considerable quantities at the latter price. In 75's, there is still business doing at 2s. 2d. f.o.b.; but, as a rule, consumers do not care to offer more than 2s. 1½d. for this quality. Crystals are fairly steady at present; but prices paid do not improve, though one or two manufacturers are reported to have raised their quotations for 34-35 per cent. In creosote, the London market is decidedly firmer; and there has been more doing in salty oil for both prompt and forward delivery. In the North, several small contracts have been arranged for forward delivery; but prices do not show signs of improvement.

The average values during the week were: Tar, 17s. to 21s. Pitch, London, 28s.; east coast, 27s.; west coast, 25s. Benzol, 90 per cent., 9¼d.; 50-90 per cent., 10¼d. to 10½d. Toluol, 1s. 0½d. to 1s. 1d. Crude naphtha, 4¼d.; solvent naphtha, 1s. to 1s. 1½d.; heavy naphtha, 11¼d. to 1s. Creosote, London, 1 13/16d. to 1¾d.; North, 1⅞d. to 1 7/16d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 10d. Refined naphthalene, £4 10s. to £8; salts, 20s. to 21s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been quiet during the past week; but there is certainly a very good inquiry for forward delivery. So far as prompt is concerned, there has not been very much doing; but any parcels which have been offering appear to have been fairly well sold. Beckton still maintain their price at £12 12s. 6d.; but they are quite unable to do business at this figure. In Hull, the market remains steady; but there is very little offering, and prices rule at from £12 5s. to £12 6s. 3d. The market in Leith is reported to be fairly firm, and £12 10s. may be taken as the ruling price. In Liverpool, several small lots have changed hands at from £12 6s. 3d. to £12 7s. 6d.

A resolution has been passed by the Gas Committee of the Coventry Corporation that in future service-pipes from the mains are to be laid only to the boundary of private property at the expense of the Corporation, and that property-owners are to be required to pay for the portion of the service beyond this point.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER **120** MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

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7, BISHOPSGATE STREET WITHOUT, LONDON, E.C.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The recent increased demand for coal for domestic purposes shows no abatement. It is calculated that in Manchester alone 500,000 tons are annually consumed. Prices, however, show neither advance nor decline. The prospects are rather on the side of easement. A better demand for forge coal is reported, owing to the betterment in the iron trade. Engine coal is also firm; and colliery proprietors are getting better prices on new and renewed contracts. Some of these contracts are for six, and others for twelve months. Municipal corporations and other gas manufacturers are just now looking about for gas coal for the next twelve months. Contracts are being arranged in several places. Coalowners generally are asking rather higher terms than a year ago, and so far appear likely to obtain slight advances. In London, 10½d. and 1s. per ton more is being secured on this description of coal. New cannel contracts are being renewed on the same terms as last year. Furnace coke at the pits is in good request at from 18s. to 20s. per ton. Coal for shipping is steady. Last week's quotations hold good.

Northern Coal Trade.

There has been an outburst of great activity in the coal trade of the North; events in France having caused so sharp a demand for that country that more steamers have been chartered in a recent day for coals for one port than were sent there in the whole of the past month. The demand has been both for steam and gas coals; and it has driven up the prices so very irregularly that quotation is very difficult with any exactness. In steam coals, about 11s. per ton f.o.b. is the quotation given for best Northumbrian, second-class steams are 9s. 9d. to 10s., and steam smalls vary as much as from 6s. to 8s., and are both dear and scarce for prompt delivery. Should the French demand subside, a fall in prices must be looked for. In the gas coal trade, some demand has also shown itself for France; and it is said that one gas company in that country has bought about 26,000 tons monthly for the next three months, at prices that are fully average. This and other contracts are expected to influence the London ones yet to be fixed. Another contract, at a price likely to yield about 9s. 10½d. per ton f.o.b. for best Durham gas coals, is said to have been concluded for Russia; but the price allowed for the fuel depends in degree on the freight, which fluctuates. The gas coal market, it will thus be seen, is excited; and it may be a week or two before prices really settle down to normal values. Coke is rather quiet; and though gas coke is now in smaller supply, there is not much change for the better in price. With companies that can ship, gas coke is now steady.

Scotch Coal Trade.

There are signs of returning activity, which is attributed to the near prospect of trade with Baltic ports, to which may be added the fact that at present there are more inquiries from abroad than usual, on account of circumstances which are known to all. The Baltic is already open, which is unusually early; and there is an expectation that the trade with Russia will be larger this year than usual. Splint is steadying in price, presumably in view of prospective requirements of coal contracts for the forthcoming twelve months now falling to be settled. Ell is also going off well. The prices quoted are: Main 7s. 6d. to 8s. per ton f.o.b. Glasgow, ell 8s. 9d. to 9s. 9d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 220,530 tons—a decrease of 11,128 tons upon the previous week, but an increase of 11,354 tons upon the same week of last year. For the year to date, the total shipments have been 2,425,241 tons—an increase of 113,140 tons upon the corresponding period of 1905.

Water Charges at Birstall.

The Birstall Urban District Council have been trying to induce the Bradford Corporation to reduce the charge of 9d. per 1000 gallons made for the supply of water in bulk. Early this month a deputation waited on the Bradford Water Committee with regard to the matter; and a reply has since been received from Mr. J. Watson, the Engineer, to the effect that the Committee cannot recommend the Town Council to make any reduction. He points out that all the authorities who are supplied with water within the Bradford area pay a uniform price, and that the agreements with each stipulate that no reduction can be made to one which does not at the same time apply to all. The Committee, however, would agree to recommend the taking over of the Birstall Council's distribution system, and pay for the same at a value to be ascertained, and distribute the water within their district at the following rates: Domestic rate, same as charged in Bradford; trade rates by meter, same as those paid in Bradford for the time being, which are 9d. per 1000 gallons for the first 400,000 gallons per quarter, and 7½d. per 1000 gallons for all above this quantity; miscellaneous rates, same as Bradford; and no public rate-in-aid to be laid. This proposal has not been entertained by the Birstall Council, who have agreed to write to the other authorities who take their water from Bradford, asking them to join Birstall in again approaching the Corporation with a view to getting the charges reduced.

Richmond and the Sulphur Restrictions Bill.—The Richmond Corporation have decided not to oppose the Sulphur Restrictions Removal Bill which is being promoted by the Richmond and other Gas Companies. The majority of the members seemingly were uninfluenced by the statement of Alderman Burt, that in Richmond they had not the means of daily supervision of the gas which was practised in regard to the London Companies. What, it is stated, had more weight with them was the somewhat large prospective expenditure on fees for Counsel and expert witnesses, and the belief that no appreciable advantage is gained by the present restrictions.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Buffalo, N.Y.	2,000,000	Newcastle-on-Tyne	1,800,000
Windsor St. Works, Birmingham	2,000,000	Winnipeg, Man.	500,000	Leeds	1,800,000
Saltley Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Malton	150,000
Colchester	300,000	York	750,000	Smethwick	500,000
Birkenhead	2,250,000	Rochester	500,000	Gravesend	300,000
Swindon (New Swindon Gas Co.)	120,000	Kingston, Ont.	300,000	Pernambuco, Brazil	125,000
Saltley, Birmingham (Second Contract)	2,000,000	Crystal Palace District	2,000,000	Duluth, (Second Contract)	300,000
Windsor St., Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Leicester (Second Contract)	1,000,000
Halifax	1,000,000	Caterham	150,000	Newport (Second Conttract)	250,000
Toronto	250,000	Leicester	2,000,000	Brockville	250,000
Ottawa	250,000	Enschede, Holland	150,000	Toronto (Third Contract)	750,000
Lindsay (Remodelled)	125,000	Buenos Ayres (River Plate Co.)	700,000	Montreal, Ont. (Second Con.)	1,800,000
Montreal	500,000	Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
Toronto (2nd Cont., Remodelled)	2,000,000	Kingston-on-Thames	1,750,000	Hamilton, Ont.	400,000
Belleville	250,000	Accrington	500,000	Rochester (Third Contract)	1,600,000
Ottawa (Second Contract)	250,000	Tonbridge	300,000	Leeds (Second Contract)	900,000
Brantford (Remodelled)	200,000	Stretford	500,000	Buenos Ayres (Primitiva Co.)	1,200,000
St. Catherines (Remodelled)	250,000	Oldbury	300,000	Buenos Ayres (New Co.)	1,200,000
Kingston, Pa.	125,000	Todmorden	500,000	Christchurch, N.Z.	300,000
Peterborough, Ont.	250,000	Saltley, Birmingham (Third Contract)	2,000,000	Rochdale	1,600,000
Wilkesbarre, Pa.	750,000	York (Second Contract)	750,000	St. John's, Newfoundland	250,000
St. Catherines (Second Cont.)	250,000	Rochester (Second Contract)	500,000	Brantford (Second Contract)	400,000
		Newport (Mon.)	250,000	Smethwick (Second Contract)	500,000
		Tokio, Japan	1,000,000	Pontypridd	250,000
				Montreal (Third Contract)	1,800,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Birmingham Gas-Fitters and the Gas Committee.

The Birmingham and District Master Gas-Fitters' Association had their first annual dinner last Wednesday, under the presidency of Mr. Charles Breeden, when opportunity was taken to inveigh against the Gas Committee of the Corporation for the attitude they assumed towards the Association on the occasion of the recent interview. This was done by Mr. Thacker, in proposing the toast of "Our Cause." He said that the Association did not mean to submit tamely to the aggrandizement of the Municipality, who sought to make money for the citizens at large at the expense of one section of the community, and that section their own. He suggested that the manufacturers and wholesale dealers could help the organization very much, either by refusing to supply the Municipality with fittings, or else by supplying them with the fittings at a higher price than they charged the gas-fitters. If they did this, the public would be obliged to go to the legitimate trader for their supplies. He also advocated intercombination among the various trade associations in the city. In proposing the health of the Chairman and Secretary, Mr. G. Beebee also referred to the recent interview with the Gas Committee. As this attempt had failed, they meant to take other measures. They intended to spring a surprise-packet upon the City Council, and to cause such consternation among the public as would necessarily result in their getting their just demands conceded. Mr. Breeden, in responding, said the Plumbers', Painters', and Ironmongers' Associations had all agreed to work with them; and he believed the Builders' Association also would join them. With such a formidable organization, he thought they would be able to accomplish much for the amelioration of their condition as traders.

Effect of the Reduced Price of Gas at Torquay.

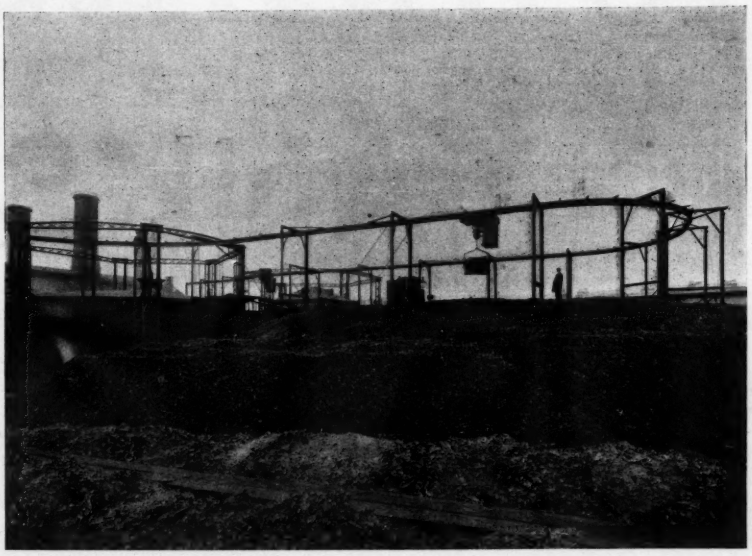
An exceedingly gratifying report was presented at the annual meeting of the Torquay Gas Company last Thursday. A year ago the price of gas was reduced from 3s. to 2s. 11d. per 1000 cubic feet; and the result has been so satisfactory that the Chairman (Mr. J. Kitson) was able to announce that it had been decided to bring it down to 2s. 10d. This is the lowest figure at which gas has been sold in Torquay since the formation of the Company in 1860. The report of the Directors set forth that the reduction in price had given great satisfaction, as was evidenced by increased sales, and that further extensions of the works would soon become necessary as the result. Mr. Kitson, in his speech, remarked that the debit balance on the capital account had slightly increased, and some further shares might be offered later on. On revenue account, the total expenditure was £25,839, against £25,865 in 1904; while the receipts totalled £33,323, against £33,822. The balance carried to the profit and loss account was £7484, compared with £7957 in 1904. The number of consumers had augmented by 209; and the consumption of gas exceeded that of 1904 by 4 million cubic feet. Notwithstanding the reduction of 1d., the sales realized £22,878, against £22,622. The shares of the Company continued to fetch good prices when offered, and there was no doubt that gas was holding its own. In view of the fact that the works were a considerable distance from the coalfields, lowering of the price to 2s. 11d. was a matter of which they had right to be proud. It had, however, been decided to do still more for the consumers; and as from Lady Day the price would be 2s. 10d., while for gas used for motive power the charge would be 2s. 3d. instead of 2s. 6d. The Chairman also announced that negotiations were in progress between the Company and the Corporation with reference to the public lighting. It is proposed by the Corporation that incandescent lighting shall be carried out in those parts of the borough which are lighted by gas. Mr. Kitson said that if satisfactory terms could be arranged, the Company would be very happy to assist the Corporation in the matter. An improvement in the lighting will, no doubt, be generally appreciated, and will be welcome to visitors and residents alike. The shareholders heartily endorsed the action of the Directors, re-elected the retiring members of the Board, and thanked them and their colleagues, as well as the staff, for their services.

Condition of the Richmond (Yorks.) Gas-Works.—At a special meeting of the Richmond (Yorks.) Town Council last Tuesday, a report was presented by the Gas Committee on the condition of the works; and a recommendation was made that £3000 should be spent on improvements. It was, however, decided to postpone a decision on the matter for three months. Several members of the Committee expressed dissatisfaction at this determination, and threatened to resign.

Visit of Scholars to the Longwood Gas-Work.—The first visit to the Longwood Gas-Works under the scheme arranged between the Gas Company and the local Education Committees, to which reference has already been made in the "JOURNAL," took place on the afternoon of the 16th inst. The boys from the Crow Lane School, in charge of the Master (Mr. Hoyle) were arranged in three parties, and were conducted round the works by the Engineer (Mr. J. H. Brearley) assisted by Messrs. J. W. Brearley and E. Sainter. After the various processes had been explained, a short lantern lecture was given in the Board-room, by means of which the chief points explained to the boys were emphasized.

Fatality at the Old Gas-Works at Ilfracombe.—The dismantling of the old works of the Ilfracombe Gas Company was attended on Thursday by an accident which caused the death of George Sanders, a mason. The men were taking down the framework of a gasholder, when part of it collapsed. Sanders was thrown into the tank, and was pinned underneath the water by a girder which fell on him. Fortunately the accident happened as the men were leaving for dinner, or the consequences would have been more serious. As it was, they were clear of the wreckage, though they were still in the yard and were spectators of the occurrence. The Fire Brigade was summoned to pump out the water in the tank, in order that the body might be recovered—an operation that took several hours. Mr. Armstrong, the Company's Manager, and several of the Directors were on the ground during the evening superintending these operations.

TEMPERLEY TRANSPORTERS



Temperley Transporter Plant for Storing Coke at the Paisley Corporation Gas-Works. The same plant is used for screening and loading into delivery carts.

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Penrith Water Scheme.

The Penrith Special Water Committee have submitted to the Urban District Council a lengthy report, which concludes as follows: The report presented last November contains all data affecting the respective merits and costs of the improved River Eamont scheme and the Glenderamakin gravitation scheme; and upon that report, with the assured reliability of the Engineer's estimate, the Sub-Committee definitely recommend the adoption and carrying out of the Glenderamakin scheme, as prepared by Mr. Baldwin Latham, the Engineer, and that a Bill should be promoted in Parliament for the necessary powers, with clauses giving the Rural District Council the privilege of taking a supply for their area from the Urban District Council up to 100,000 gallons a day. By proceeding in the manner suggested, it will not preclude the Rural District Council from reconsidering their position, nor the Urban District Council from arranging prices and conditions with the Rural District Council if hereafter possible. The Committee earnestly desire to impress the General Purposes Committee with the importance of the present Council adopting a decisive resolution on the question of water supply improvement, which has been most carefully and exhaustively considered by them at considerable cost. It is worthy of notice that the question has been under consideration for fourteen years; and that the cost of investigations up to date will be very little short of £2000. The Council cannot, therefore, but appreciate the absolute necessity of settling the matter, as it must be admitted that further delay would be unwarrantable in view of the heavy expenditure already incurred.

Reduction in Price at Shoeburyness.—The Shoeburyness Urban District Council have reduced the price of gas from 5s. 3d. to 5s. per 1000 cubic feet.

Gas-Main Extension at Rickmansworth.—The Ricksmansworth Urban District Council have resolved to apply to the Local Government Board for sanction to a loan of £3000, for an extension of the gas-mains to Chorleywood. In moving the adoption by the Council of the Gas Committee's recommendation to this effect, Mr. Taylor said there was every reason to believe that the extension would be a valuable addition to the undertaking. Chorleywood had been increasing within the last few years to the extent of about £500 a year in rateable value. At the present time they had plant sufficient to turn out half as much again gas as they were doing; and they could do this practically without additional expenditure for labour. The cost of the manufacture of gas now worked out at 1s. per 1000 cubic feet; whereas under the old Company it was 1s. 2d. He was firmly convinced that the gas undertaking was going to be a profitable investment for the town. Their Consulting Engineer (Mr. Frank Jones), who had been over the district, said there could not be a shadow of a doubt that the extension to Chorleywood would pay them well; and the sooner they took the gas there the better.

A Ten-Million Feet Holder for Manchester.—Manchester is, says the local "Courier," about to come into the front rank of possessors of gigantic gasholders. Some years ago when one of these huge circular tanks capable of holding 7 million cubic feet was put up at the Bradford Road works of the Gas Department, it was possibly thought that finality had been reached. During this [last] week, the Gas Committee have paid a visit of inspection to the same works, however, and have fixed on a site for the reception of a holder with a capacity of 10 million cubic feet. There are already five gasholders at Bradford Road, the whole of which have a storage capacity of little less than 14 million cubic feet, which is the daily productive power of the works. The four gas-stations of the Manchester Corporation have a productive power of 25⅝ million cubic feet, and a storage capacity of 24½ millions. Borings for the foundations of the new holder will take place soon.

The Gas Suffocation Case at Birkenhead.—The Jury who inquired into the death of the youth, Thomas Nugent, who was suffocated in a Birkenhead lodging house on the morning of the 13th inst., under circumstances which were briefly recorded in last week's "JOURNAL" (p. 820), returned a verdict of "Death from coal-gas poisoning," and added that there was no blame to be attached to any of the Corporation employees. Evidence was given to the effect that the gas had been cut off from the upper rooms by the Corporation eighteen months or two years ago; and it was from the pipe that had been disconnected that the escape took place. There was a bracket 6 feet from the floor; and the pipe, which led up in the angle formed by the wall and the window moulding, had been severed and closed, though the pipe was cracked 2½ inches below where it had been severed. Mr. F. D. Haines, the Assistant Distributing Engineer, gave it as his opinion that the pipe must have been worked about; and that the cracks must have been caused in this manner. The top of the pipe was closed.

Herne Bay Gas Company.—In the report presented by the Directors of this Company at the annual general meeting on Thursday, they stated that the receipts from the sale of gas were very nearly maintained last year, though a reduction in price of 1d. per 1000 cubic feet was made to the consumers from Lady Day. The Directors therefore felt justified in making a further reduction of 1d., as from the 25th inst. Residuals realized less favourable prices; and there was a consequent decrease under this head. The total revenue was £11,267, and the expenditure £7581—leaving £3686 to go to the profit and loss account. The Directors have written off a further £1000 from the lease redemption account, and have transferred £65 to the reserve account—raising it to £1500. An interim dividend at the rate of 7 per cent. per annum on the original capital, and 5 per cent. on the additional capital, was paid in August last; and the Directors recommended a dividend for the whole year at the rate of 8⅛ per cent. on the former and £5 19s. per cent. on the latter capital, less income-tax and the amount of the interim dividend. There would then remain £535 to be carried forward to the next accounts.

GASHOLDERS
AND
STEEL TANKS.

WILLEY & Co., LTD.
ENGINEERS,
LONDON & EXETER.

Telegrams: WILLEY, EXETER.

Completion of the New Croton Dam (New York).—In view of the approaching completion of the new Croton dam in connection with the New York Water-Works, we reproduced, in the "JOURNAL" for the 6th ult. (p. 373), from the "Engineering Record," some particulars in regard to this great engineering work, which has been in progress for thirteen years. The dam was finished on the 17th inst.; and it ranks in importance with the most famous water-works of the world.

Cost of Public Gas Lighting at Cardiff.—Mr. Harpur, the City Engineer of Cardiff, has reported to the Lighting Committee that £600 will be saved this year in the cost of gas lighting in the streets, as the result of the conference in London between the Corporation and the Gas Company. This was one of the conditions of the withdrawal of the Corporation's opposition to the Company's Bill. Next year the saving will be greater. The Committee have therefore reduced this portion of their estimate by £600.

Reduction in Price at Tottenham.—Mr. Corbet Woodall, the Chairman of the Tottenham and Edmonton Gas Company, in an interview with the Legal Committee of the Tottenham Urban District Council (*ante*, p. 812), stated that if the Company's Bill went through Parliament without opposition, the price of gas would be reduced by 2d. per 1000 cubic feet as from Jan. 1 last. The opposition having been abandoned, the Company announce that as from the reading of the ordinary gas-meters for the Christmas quarter, 1905, the price of gas will be reduced to 2s. 8d. per 1000 cubic feet; and that as soon as practicable the prepayment meter price changers will be adjusted to increase the quantity of gas to 24 cubic feet for each penny. Referring to the matter, the "Tottenham Herald" says: "We congratulate both sides upon the success of the negotiations; and we congratulate the consumers of the district on the result."

Metropolitan Water Board and the Lea Valley Bill.—A special meeting of the Metropolitan Water Board was held on Friday to consider whether or not the Lea Valley Bill should be further proceeded with. The Law and Parliamentary Committee reported that their investigations, in preparing the case which the Board would desire to submit to Parliament in support of the Bill, had brought to their notice certain matters of considerable importance. They were of such a nature that, in the time available, and with the evidence placed at their disposal, the Committee felt the utmost difficulty in preparing such a case as would, in their judgment, enable the scheme proposed by the Bill to be properly supported in the present session. In a private and confidential report, they set out the whole of the facts which had come to their knowledge and the nature of the advice they had received; and they recommended the Board to withdraw, at all events for the present session, such parts of the Bill as related to the scheme for the construction of intercepting sewers, sewage disposal works, and a new intake at Feilde's Weir, so that the matter might receive further consideration in the light of recent developments. The Works and Stores Committee also submitted a report urging that the Bill should be proceeded with. On a show of hands, the recommendation of the Law and Parliamentary Committee was adopted by 21 votes to 18.

During the sitting of the House of Commons on Monday last week, the electric light failed, and the Chamber was left for some minutes in semi-darkness.

The Smethwick Gas Committee have agreed to pay £1000 before Sept. 30 next as the first instalment of their promised contribution of £5000 towards the erection of a new Council House.

The Bolton Town Council have decided to take Counsel's opinion as to the legality of persons interested, directly or indirectly, in the Council's affairs, contracting and trading with the Corporation.

The Directors of Sir William Arrol and Co., Limited, after transferring £1979 to the reserve, recommend a dividend at the rate of 10 per cent. per annum for the year ended Dec. 31 last; leaving a balance of £6787 to be carried forward.

It has been decided that a deputation of three members of the Belfast Gas Committee, with Mr. James Stelfox, the Engineer, shall be appointed to visit the Bournemouth Gas-Works, for the purpose of seeing at work the vertical retorts installed there. It is understood that the deputation will not go for a couple of months yet, as the retorts are at present closed down for repairs.

The Gas Department of the Oswaldtwistle Urban District Council have selected three gas stove makers to supply their requirements in gas-cookers, and an exhibition is to be held from the 8th to the 18th of May inclusive. The firms selected are the Cannon Iron Foundries, Limited, Messrs. Parkinson and W. & B. Cowan, Limited, and the Richmond Gas Stove and Meter Company, Limited.

The Carrickfergus Urban District Council have accepted the offer of Messrs. Curran Bros. to erect and maintain for five years a system of electric lighting. The tender was to erect, fit up, and keep in order as many lamps as might be required for street lighting for the sum of £1 10s. each lamp—twelve of the lamps to be 50-candle power, and the remainder 30-candle power. The offer of the Gas Company was to do the lighting at a charge of £1 7s. 6d. per lamp.

A Company has been formed with a capital of £100,000, in £1 shares (50,000 being 5 per cent. cumulative preference), to acquire the business now carried on in England as Bryan Donkin and Clench, Limited; to adopt an agreement with A. S. L. Melville, A. H. L. Melville, E. A. Smith, A. B. L. Melville, and G. H. Shipley, and to carry on the business of agricultural and general engineers, iron-founders, manufacturers of electrical and other machinery, &c. There will be no initial public issue.

A parish meeting was held at Otford last Tuesday to discuss the advisability of efficiently lighting the village. A letter was read from the Sevenoaks Gas Company, stating that they could not entertain the idea of taking gas to Otford, owing to the great expense which would be entailed in laying mains. The return would be altogether inadequate to warrant the outlay. Two other propositions were put forward (one for lighting by electricity, and the other for illumination by oil); but the matter was adjourned indefinitely.

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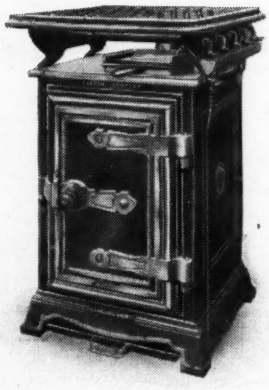

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS MANAGER. Ashford (Kent) Gas Department. Applications by April 19.
WORKING MANAGER. Rothwell Gas Department. Applications by April 1.
LEAKAGE DETECTOR, &c. No. 4570.
LEAKAGE DETECTOR. No. 4576.
COLLECTOR. Richmond Gas Company. Applications by April 5.

Situations Wanted.

ASSISTANT BOOK-KEEPER, CASHIER, &c. No. 4578.
INSPECTOR DISTRIBUTION DEPARTMENT. No. 4573.

Plant (Second Hand) Wanted.

CONDENSERS, PURIFIERS, PUMP, AND TANK. Lockerbie Gas Department. Tenders by April 4.
FRACTIONATING STILL. No. 4577.

Plant (Second-Hand), &c., for Sale.

ENGINE AND PUMPS, LIQUOR TANKS, &c. Whitehouse's Executors, Ilkeston.

Stocks and Shares.

ASCOT GAS COMPANY. April 3.
BARKING GAS COMPANY. April 3.
NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY. April 2.
PINNER GAS COMPANY. April 14.

TENDERS FOR

Benzol.

ISLE OF THANET GAS COMPANY. Tenders by April 5.

Coal and Cannel.

DUNDEE GAS DEPARTMENT. Tenders by April 2.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 9.
LIMERICK GAS DEPARTMENT. Tenders by April 14.
MANCHESTER GAS DEPARTMENT. Tenders by April 25.

General Stores, Gas-Fitter's Stores, Implements, Oils, Paints, &c.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 9.

Iron and Steel.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 9.

Light Oil.

BRIDGEWATER COLLIERIES COKE WORKS. Tenders by April 23.

Meters.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 9.

Oxide of Iron.

MANCHESTER GAS DEPARTMENT. Tenders by April 5.

Pipes (Wrought and Cast), &c.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 9.

Stoves.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 9.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism London."

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

THE KEITH LIGHT.
OVER 9000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.** Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 8, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

GASHOLDER PAINTING.
PAINTING Work for all kinds of Gas- Works Plant, Roofs, Bridges, &c., undertaken by Contract or otherwise.
FREDERICK BOYALL, 31, Regent's Row, DALSTON, N.E.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.
SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.)
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone 341, AVENUE.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAZINE—A radical Solvent and Pre- ventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

APPLICANTS for the Appointment of FITTER at the Dorking Gas-Works are THANKED, and informed that the POSITION IS NOW FILLED.

CHANGE desired by a Young Man, 25 years of age. Assistant Book-Keeper, Cashier, or Rental Clerk. Thoroughly Experienced in Gas Office Routine. Good Testimonials.
Address No. 4578, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER seeks re-engagement as INSPECTOR OF DISTRIBUTION DEPARTMENT. Thoroughly Experienced in all Branches, Automatic work, Public and Private Lighting, Mains and Services, Estimating, Canvassing, &c. Capable of Taking Charge of Show-Rooms. Highest References.
Address No. 4573, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FIRST-CLASS Man Wanted to Trace and Remedy LEAKAGE in Country District not far from London.
Send full Particulars and Wages required to No. 4576, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a capable Man to detect and remedy Leakage in Colliery district. Preference given to one having filled similar position. Would be required to fill in spare time Meter Taking, Service Laying, &c., to instructions of Foreman.
State Age and Wages required, enclosing *copies* of Two recent Testimonials, to No. 4570, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RICHMOND (SURREY) GAS COMPANY.

THE Directors of the above Company require the services of a COLLECTOR, who has been used to the routine work of a Gas Company's Office. Age limit, 25 to 30 years.
Applications, in writing, endorsed "Collector," accompanied by *copies* of not more than Three recent Testimonials, to be delivered, not later than the 5th of April next, addressed to the undersigned, from whom further Particulars may be obtained.
THOMAS MAY,
Engineer and Secretary.
Gas Offices, The Green,
Richmond, Surrey, March 23, 1906.

ROTHWELL URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

WORKING Manager required. Must be a good Fitter. None but steady and reliable men need apply.
Particulars of Duties and Salary to be given may be obtained from the undersigned, to whom written application (with *copies* of not more than Three Testimonials) must be made not later than Monday, the 2nd day of April next.
WM. TOZER,
Clerk to the Council.
Council Offices, Rothwell,
North Hants, March 15, 1906.

URBAN DISTRICT OF ASHFORD (KENT).

THE Urban District Council of Ashford (Kent) invite APPLICATIONS for the position of GAS-WORKS MANAGER. Candidates must have had Practical Experience as Manager or Assistant Manager of a medium sized Gas-Works. Any Candidate canvassing members of the Council will be disqualified.
Applications, endorsed on envelope "Gas Committee," with *copies* of not more than Three recent Testimonials (which will not be returned), and stating Age, Experience, and Salary required, to be addressed to and reach me not later than the 19th of April, 1906.
JOHN CREERY,
Clerk.
11, Bank Street,
Ashford, Kent.

WANTED, Gas Meters, Obsolete, Wets or Drys, for Cash.
ROSSE WORKS, Leeds Road, BRADFORD.

WANTED, a Fractionating Still for Benzol and Toluol.
Write, giving full Particulars, to No. 4577, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ONE Bisschop Gas Engine and Pump combined on one bed, 6½-inch cylinder pump, 3¾-inch ram, £10. Liquor or Tar Tanks, 24 ft. by 7 ft., 35 ft. by 5 ft., 40 ft. by 5 ft., Rectangular Tank, 10 ft. by 4 ft. by 4 ft.
Apply WHITEHOUSE'S EXECUTORS, ILKESTON.

GAS-MAIN Pipes, Clean and Perfect, Second-Hand 10-inch, 8-inch, 6-inch, 5-inch. Large Stock, drawn from Sockets, no broken ends, from £3 10s. to £4 10s. delivered, according to distance.
FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BOROUGH OF LOCKERBIE.

THE Gas Committee invite Offers for the supply of the following Good Second-Hand PLANT required by them—
CONDENSERS, having 8-inch connections, complete with Bye-Pass, capable of dealing with 80,000 cubic feet per day.
Two PURIFIERS, 8 feet square, with Grids and Valves complete.
One Steam Tar and Liquor PUMP, with 2-inch or 2½-inch suction and delivery.
One Cast-Iron Rectangular TANK, capacity of about 1000 or 1500 gallons.
Offers for the above, all or part, to be sent to Mr. David McJerrow, Town Clerk, Lockerbie, not later than Wednesday, the 4th of April, endorsed "Gas Plant."
Further Information, if required, may be had from Mr. R. W. COWIE, Gas Manager, LOCKERBIE.

MANCHESTER CORPORATION GAS-WORKS.

TENDERS FOR COAL AND NUTS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the supply of their requirements of Screened COAL, and Screened NUTS (unwashed) during One or Two Years at their Gaythorn, Rochdale Road, Bradford Road, and Droylsden Works, delivery to commence on the 1st day of August, 1906.
The Tender must state at what colliery the material offered is raised, and give the size of the mesh of the screen over which it is passed, with the angle of inclination of the screen.
Printed Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester, and Tenders, endorsed "Tender for Coal, or Nuts," as the case may be, must be delivered at the Gas Department, Town Hall, Manchester, before Ten o'clock on Wednesday morning, the 25th of April, addressed to the Chairman of the Gas Committee.
The Gas Committee do not bind themselves to accept any Tender, and reserve to themselves the right to divide any offer as they may deem advisable.
By order,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
March 23, 1906.

MANCHESTER CORPORATION GAS-WORKS.

OXIDE OF IRON.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of 3000 Tons of OXIDE OF IRON PURIFYING MATERIAL (Moisture not to exceed 35 per cent.), at their Gaythorn, Rochdale Road, and Bradford Road Works, during the Year ending March 31, 1907.
Sealed Tenders, endorsed "Oxide of Iron," and addressed to the Chairman of the Gas Committee, must be delivered at the Gas Department, Town Hall, Manchester, before Ten a.m., on Thursday, the 5th of April, 1906.
The Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide any Tender as they may deem advisable.
By order,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
March 23, 1906.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners invite Tenders for the supplying of—

Oils and Paints,	Yarn, &c.,
Timber,	Iron, Steel, and Implements,
Meters,	Iron Castings, &c., &c.,
Gas-Fitters' Stores,	Causeway Repairs,
Wrought-Iron Tubes and Fittings,	Gas-Cooking Stoves,
Cast-Iron Pipes and Connections,	

required for their various undertakings during the Year from Whitsunday first.
The Contractors must guarantee that in the execution of their Contracts they will pay the Standard Rate of wages, or such wages as are generally recognized as fair in their business.
Tender Forms and all Information can be had on application to the Chief Engineer and Manager at the Gas-Works, New Street.
Offers must be lodged not later than Ten o'clock on Monday forenoon, the 9th prox., in sealed envelopes, addressed to the undersigned, and marked "Tender for Oils and Paint," or as the case may be.
The Commissioners are not to be bound to accept the lowest or any Tender.
JAMES M'G. JACK,
Clerk.
25, Waterloo Place, Edinburgh,
March 23, 1906.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

GAS COAL AND CANNEL.

THE Commissioners are prepared to receive TENDERS for the supply of GAS COAL and CANNEL for delivery at their Granton Works over a period of Twelve Months or more.
The Contractors must guarantee that in the execution of their Contracts they will pay the Standard Rate of Wages, or such Wages as are generally recognized as fair in their business.
Further Particulars, Schedule, and Form of Tender may be obtained on application to the Chief Engineer, Mr. W. R. Herring, at the Gas-Works, New Street.
Tenders to be lodged by Ten o'clock on Monday forenoon the 9th prox., in sealed envelopes, marked "Tender for Coal," and addressed to the undersigned.
The Commissioners are not to be bound to accept the lowest or any Offer.
JAMES M'G. JACK,
Clerk.
25, Waterloo Place, Edinburgh,
March 23, 1906.

TENDERS FOR COAL.

THE Gas Committee of the City of Limerick, are prepared to receive TENDERS for the supply of GAS COAL required for their Gas-Works for the Year ending March 31, 1907.
Full Particulars and Form of Tender can be obtained from the Engineer.
Sealed Tenders, endorsed "Tender for Gas Coal," must be delivered at the Gas Office, William Street, Limerick, on or before Saturday, the 14th of April, 1906, addressed to the Chairman of the Gas Committee.
The Committee do not bind themselves to accept the lowest or any Tender.
HY. HAWKINS,
Engineer.
Gas-Works, Limerick,
March 23, 1906.

BRIDGEWATER COLLIERIES COKE-WORKS.
(THE EARL OF ELLESMERE.)

TENDERS are invited for the Light OIL produced at the above Works for a period of Six or Twelve Months from the 1st of May, 1906, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding on the Little Hulton Mineral branch of the London and North-Western Railway.
Tenders, endorsed "Tender for Light Oil," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 23rd of April, 1906.
Manchester, March 23, 1906.

ISLE OF THANET GAS COMPANY, MARGATE.

TENDER FOR BENZOL.

THE Directors of the above Company are prepared to receive TENDERS for the supply and delivery at their Works of about 12,000 to 15,000 Gallons of 90 per cent. BENZOL, dating April 1, 1906, to March 31, 1907, suitable for the enrichment of Coal Gas.
Further Particulars can be had of the Engineer, Mr. F. A. Winstanley.
Tenders to be endorsed "Benzol," and sent in on or before Thursday, April 5, 1906, addressed to the Chairman of the Company.
The Directors do not bind themselves to accept the lowest or any Tender.
By order,
THOS. C. FULLER, F.C.I.S.,
Secretary.
The Offices: The Dane,
Margate, March 23, 1906.

DUNDEE GAS COMMISSIONERS.
(DUNDEE CORPORATION.)

TENDERS FOR COAL.

THE Dundee Gas Commissioners are prepared to receive TENDERS for the supply of GAS COAL, SPLINT, and COKING COAL and NUTS, for delivery over a period, in the option of the Commissioners, of Six, Nine, or Twelve Months.
Offers must be made on a printed Form of Tender, which embodies the Conditions of Contract, and which may be obtained on application to the undersigned.
The Commissioners reserve the power to accept any quantity they may think fit of any Tender, or to reject any or all of the Tenders.
Sealed Offers, endorsed "Tenders for Coal," to be lodged with W. H. Blyth Martin, Esq., Clerk to the Commissioners, City Chambers, Dundee, on or before Monday, the 2nd of April next.
ALEX. YUILL,
Engineer and Manager.
Gas-Works, Dundee,
March 22, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARKING GAS COMPANY.

NEW ISSUE OF 600 £10 SIX PER CENT. PREFERENCE SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

ASCOT DISTRICT GAS COMPANY.

50 £10 FULLY-PAID SHARES.
Maximum Dividend, 10 per cent.; last Dividend, 5½ per cent. per Annum.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

ALEXANDER CAMERON,
GAS AND CANNEL COAL MERCHANT,
48, WEST REGENT STREET,
GLASGOW.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF £40,000 FOUR PER CENT. PREFERENCE STOCK.

THE Directors Offer for Sale by Tender £40,000 FOUR PER CENT. PREFERENCE STOCK, to be issued under the provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1901. Applications receivable up to Ten a.m. on the 2nd of April, 1906.

Any amount of stock being not less than £5, or a multiple thereof, may be applied for.

A deposit of 5 per cent. on the nominal amount of Stock applied for must accompany each Tender, and the balance be paid on or before the 30th of June, 1906.

Interest at the rate of 4 per cent. per Annum will be allowed from the 2nd of April upon deposits and pre-paid balances, dividend accruing from the 1st of July.

The Gas sold in 1905 was 2,887,804,000 cubic feet, and during the last Ten Years the sales have increased 49¼ per cent.

The Company has always paid its full statutory dividends.

MINIMUM PRICE—PAR.

Prospectuses and Forms of Tender will be sent on application to the undersigned.

(Signed) THOS. WADDOM,
Secretary.

36, Grainger Street West,
Newcastle-upon-Tyne,
March 13, 1906.

PINNER GAS COMPANY, LIMITED.

SALE BY TENDER OF 600 "B" SHARES OF £5 EACH.

MINIMUM PRICE, £6 15s. PER £5 SHARE.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER 600 "B" Shares of £5 each; being a portion of the Additional Capital authorized by the Pinner Gas Order, 1901.

The Shares will be allotted to the highest bidders; but no Tender will be accepted at a lower price than £6 15s. per £5 Share.

The Standard rate of dividend authorized for these Shares was 7 per cent. per annum, which was the rate paid last year; but the sliding-scale is now applicable, and the price of Gas has been reduced, and is about to be further reduced, and it is quite expected that a greater dividend will be paid for the current year, and a further increased dividend next year.

No Tender will be received after Twelve o'clock noon on Saturday, the 14th day of April, 1906.

Particulars and Forms of Tender can be obtained on application to the Secretary.

By order,
WM. WMS. BOX,
Secretary.

28, Great James Street, Bedford Row,
London, W.C.,
March 16, 1906.

GILBERT LITTLE CO.Y LTD.

Conveyor and Elevator Specialists,
Smethwick, Birmingham.

Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist; he will supply them.

NOW READY, THE SECOND EDITION OF

GAS COMPANIES' BOOK-KEEPING.

A Practical Treatise on the Keeping of Gas Companies' Accounts.

BY
JOHN HENRY BREARLEY, and
BENJAMIN TAYLOR.

THE VOLUME CONTAINS TWO WORKS:

1—Gas Companies' Book-Keeping.
2—Useful Forms for Gas Undertakings.

Price Net: Complete, Cloth Bound, 12s. 6d.; Morocco Gilt, 18s.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

JOHN HALL & CO. OF STOURBRIDGE, LIMITED, STOURBRIDGE,

Manufacturers of

FIRE-BRICKS, LUMPS, TILES, GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY, LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THE

"BOYS" CALORIMETER

for determining the calorific value of gases

IS MADE BY

JOHN J. GRIFFIN & SONS,

— LIMITED, —

Makers of Scientific Apparatus,

KINGSWAY, LONDON, W.C.

MIRFIELD GAS COAL

UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

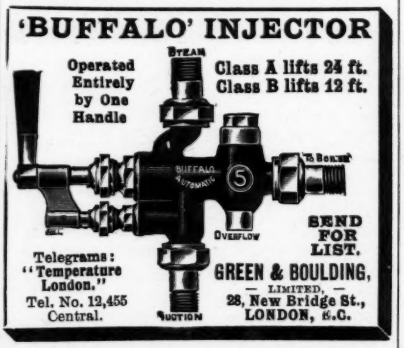
Please apply for Prices, Analyses, and Reports, to the

MIRFIELD (GAS COAL) COLLIERIES

RAVENSTHORPE, NEAR DEWSBURY.

LONDON: 22, Park Village East, N.W.

'BUFFALO' INJECTOR



THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES,

AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT, BRETTELL'S ESTATE LIMITED,

FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: H. CRESSWELL & CO., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

THOMAS DUXBURY & CO., 16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

The Telegraphic Address

OF THE

STAFFORDSHIRE TUBE CO., LIMITED,

IS STILL

"UNBEATEN BIRMINGHAM."

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD., CHESTERFIELD.

THE

"ROTARY" STATION METER.

Efficiency Demonstrated.

APPLY—

T. G. MARSH, MAWSON CHAMBERS, DEANSGATE, MANCHESTER.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

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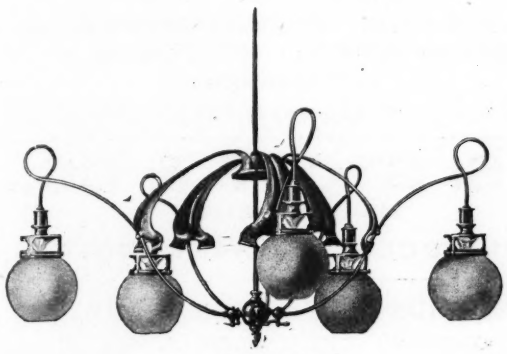

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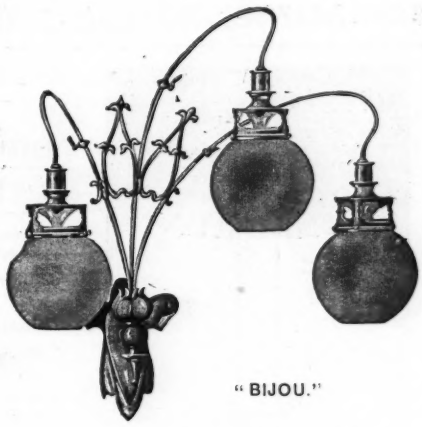

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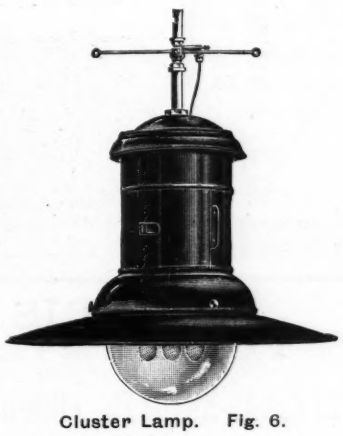

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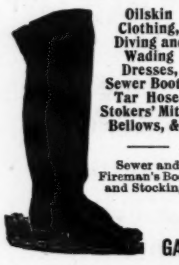

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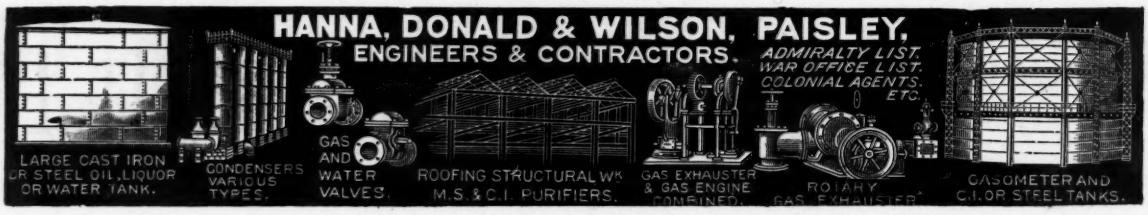
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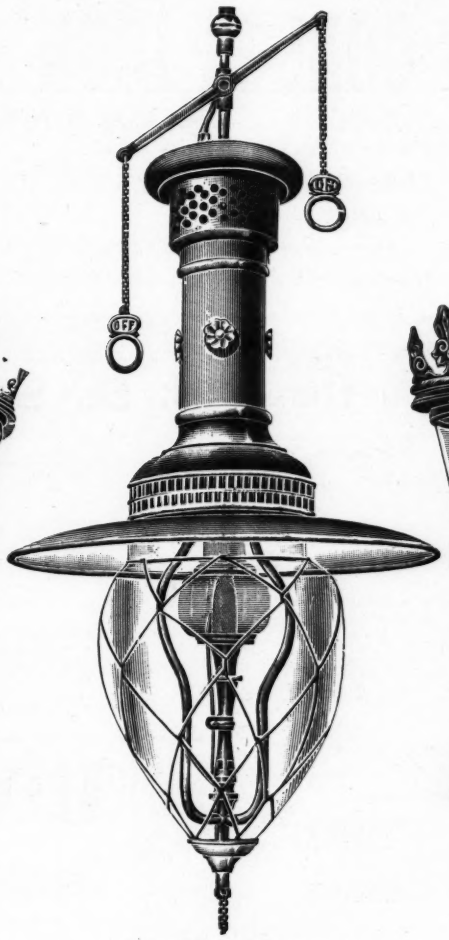

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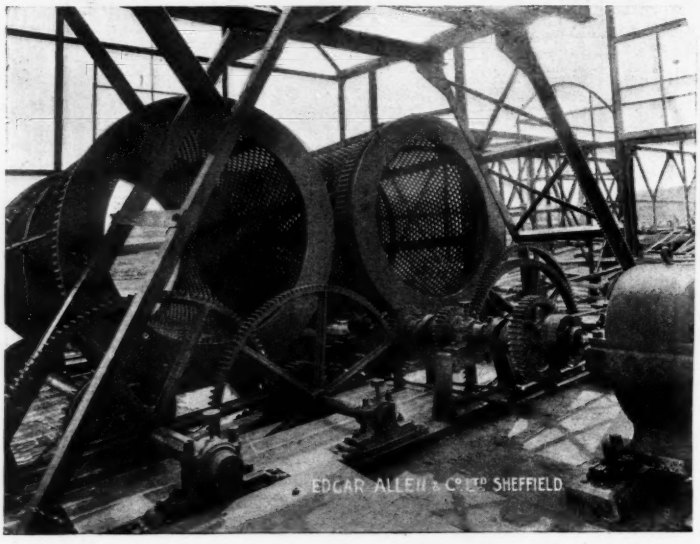

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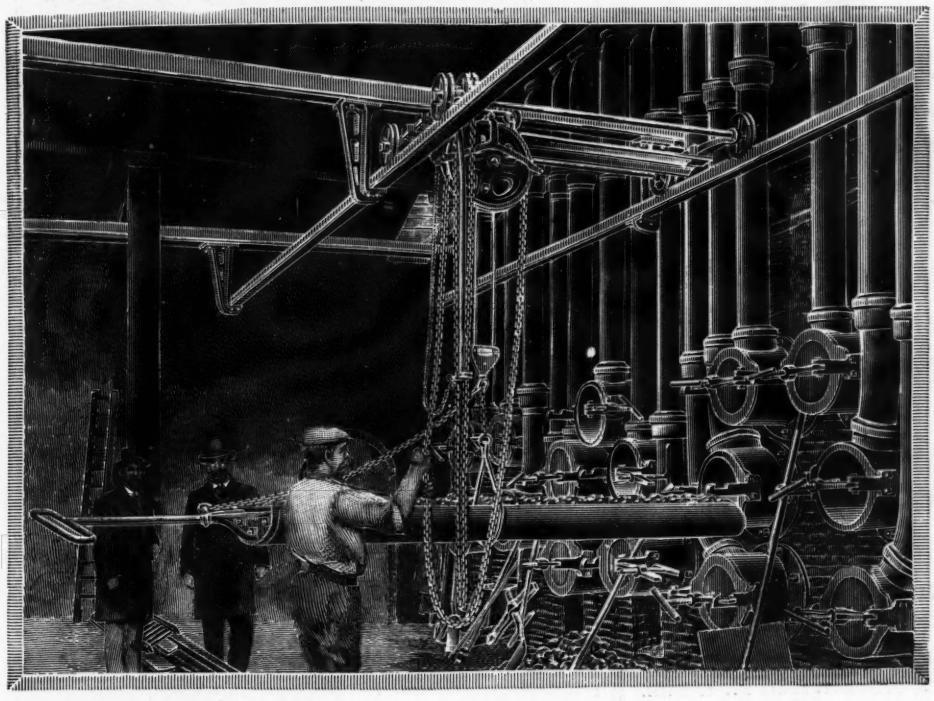

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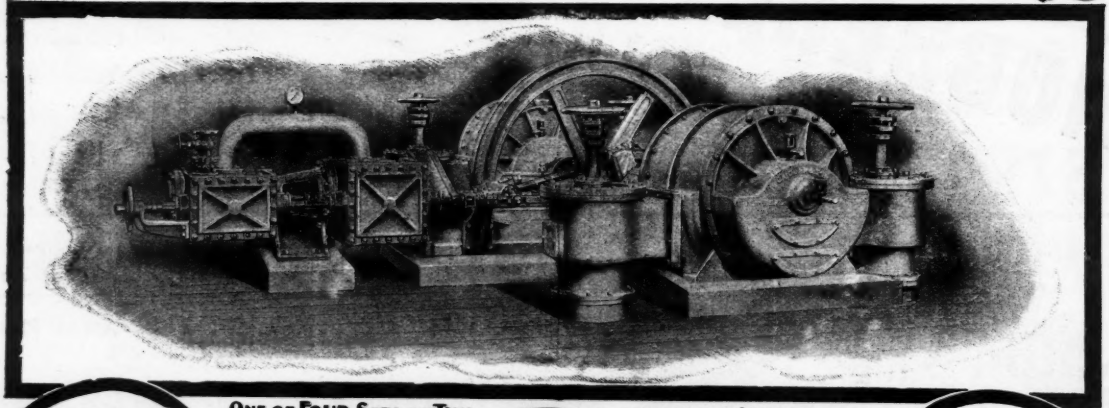

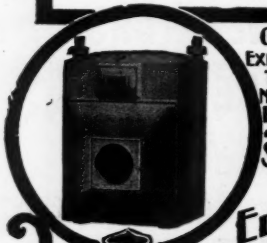

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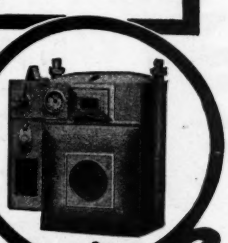

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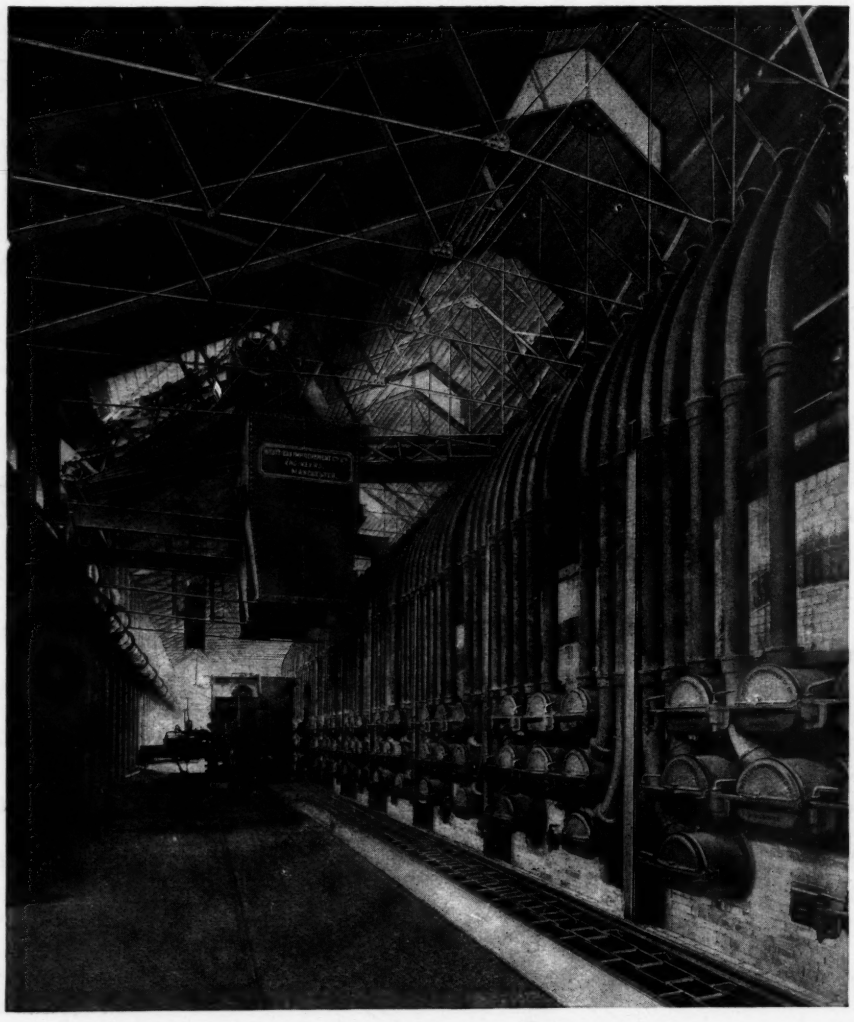

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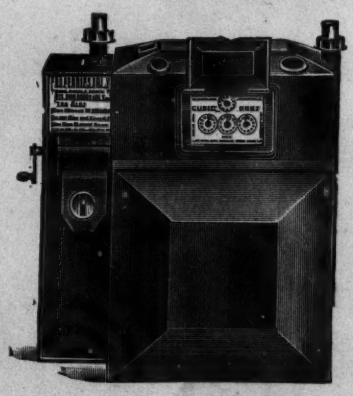

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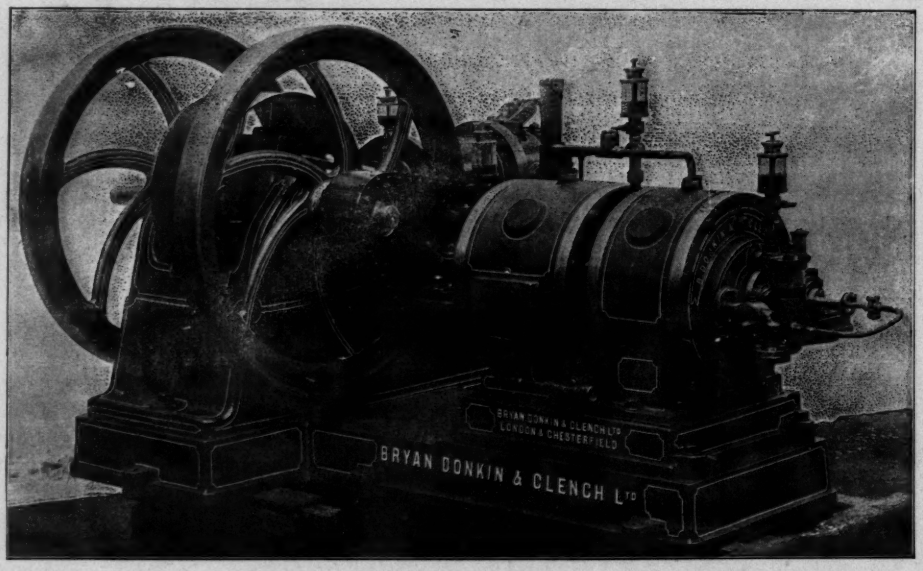

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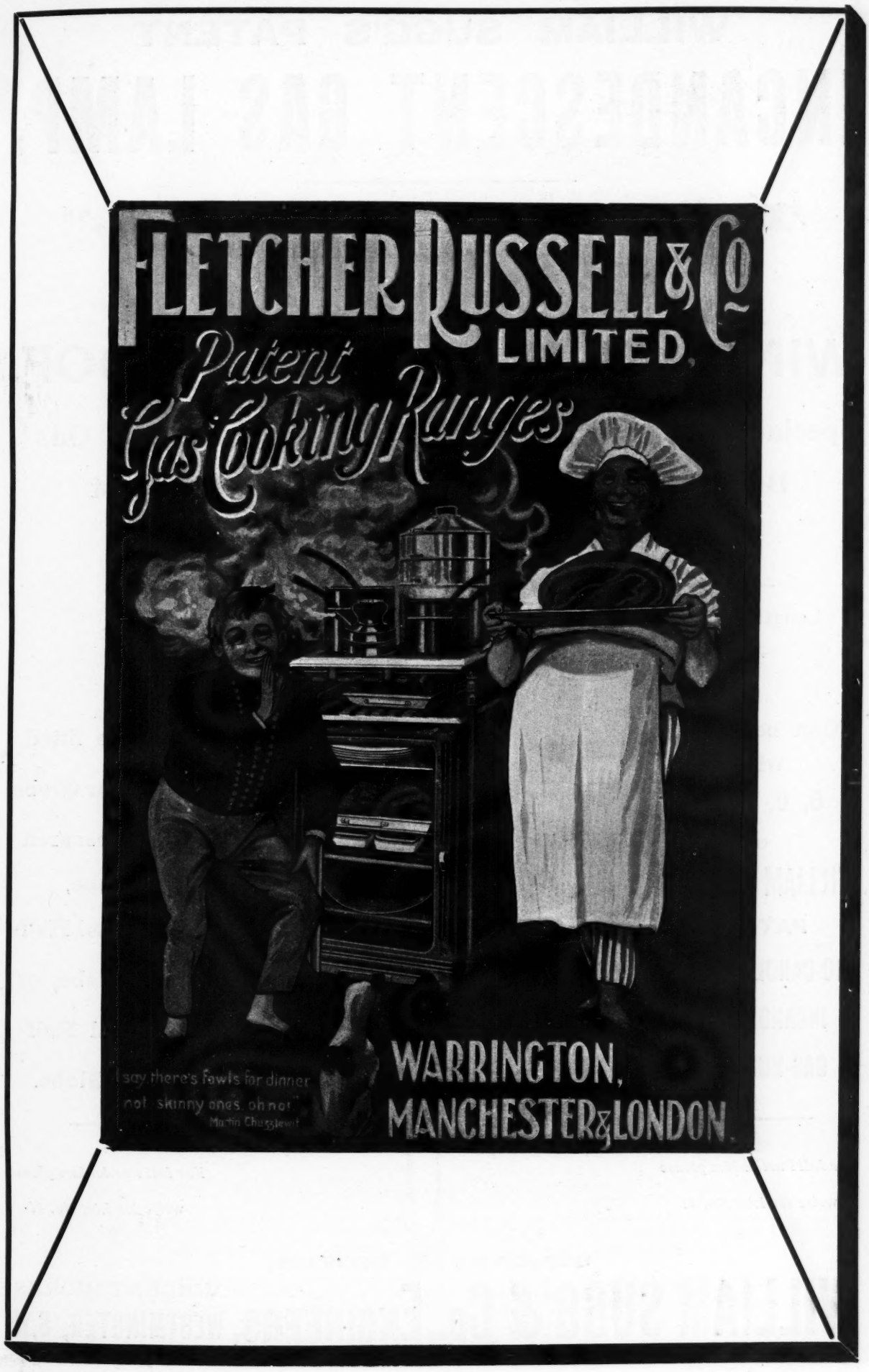
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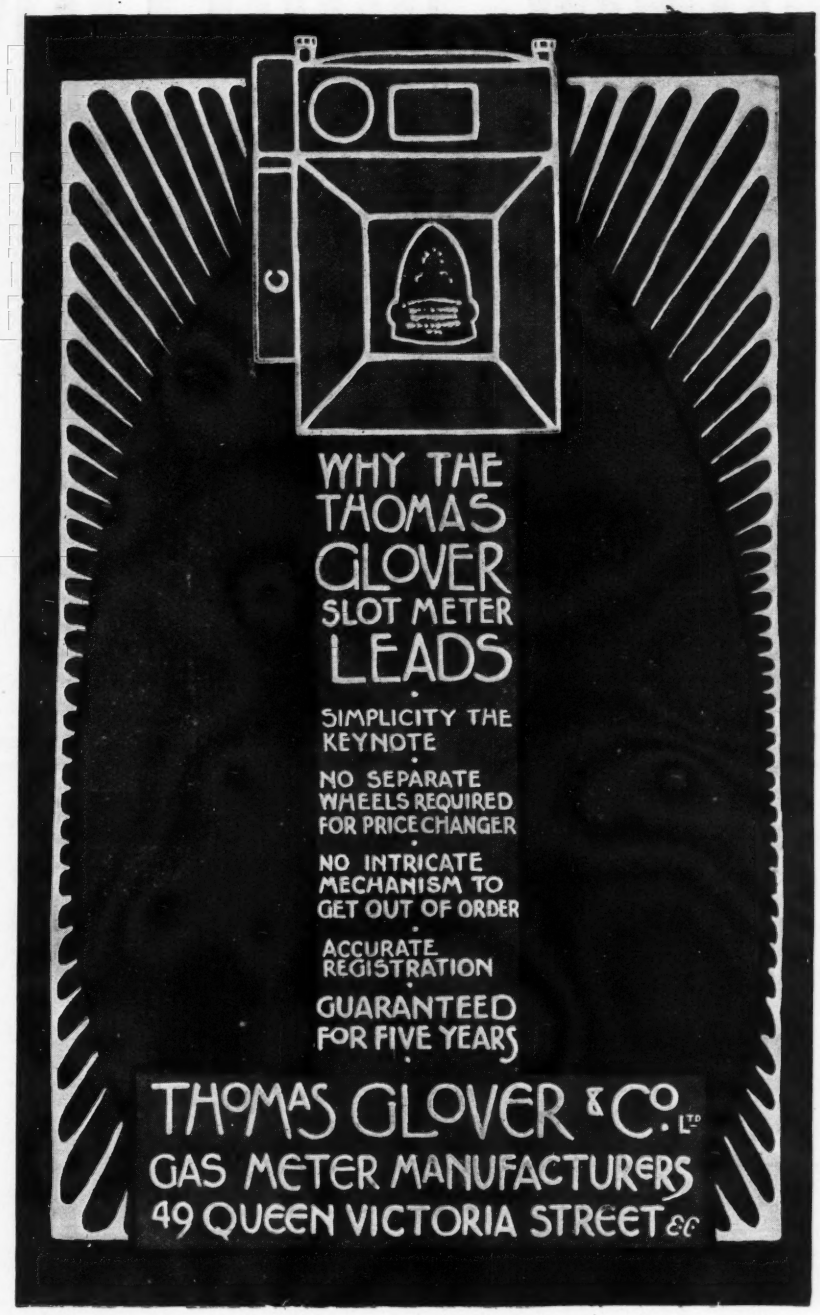

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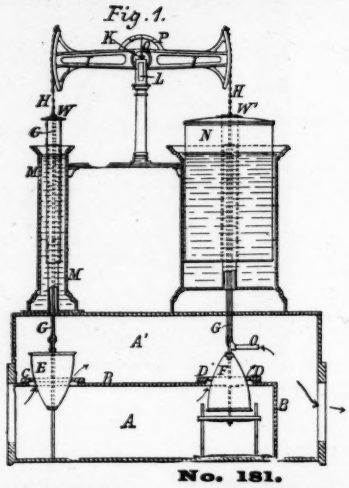
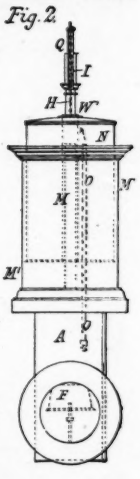


Fig. 2.



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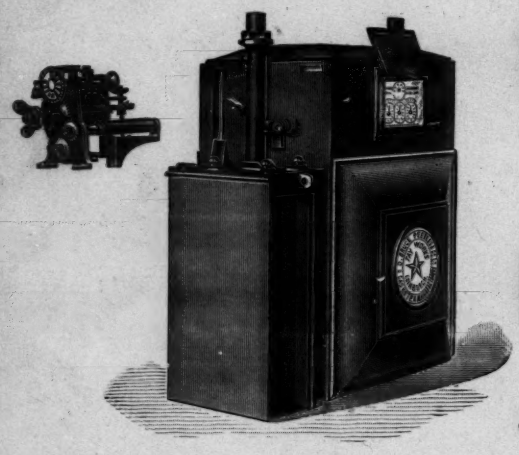

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